DOE/EA-1277

Environmental Assessment

Expanded Ponnequin Wind Energy Project
Weld County, Colorado

U.S. Department of Energy

Denver Regional Office
Commercialization Ventures Program
1617 Cole Boulevard
Golden, Colorado 80401

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LIST OF FIGURES

[NOTE: FIGURES ARE NOT AVAILABLE ELECTRONICALLY]

ACRONYMS AND ABBREVIATIONS

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CDW	Colorado Division of Wildlife
dBA	decibel level averaged
Disgen	Distributed Generation Systems, Inc.
DOE	U.S. Department of Energy
EA	Environmental Assessment
FAA	Federal Aviation Administration
FR	Federal Register
kV	kilovolt (one kV = 1,000 volts)
kW	kilowatt
kWh	kilowatt-hour
MBTA	Migratory Bird Treaty Act
mph	miles per hour
MW	megawatt
MWH	megawatt-hour
NBS	National Biological Service
NEPA	National Environmental Policy Act
OAPH	Colorado Historical Society, Office of Archaeology and Historic Preservation
P.L.	Public Law
PSCo	Public Service Company of Colorado
PUC	Public Utilities Commission (of Colorado)
rpm	revolutions per minute
SCADA	supervisory control and data acquisition (system)
SCS	Soil Conservation Service, now known as the Natural Resource Conservation Service
USFWS	U.S. Fish & Wildlife Service
WAPA	Western Area Power Administration
Z-46	Zond Z-46 wind turbine

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) has considered a proposal from the State of Colorado, Office of Energy Conservation (OEC), for funding construction of the Expanded Ponnequin Wind Project in Weld County, Colorado. OEC plans to enter into a contracting arrangement with Public Service Company of Colorado (PSCo) for the completion of these activities. PSCo, along with its subcontractors and business partners, are jointly developing the Expanded Ponnequin Wind Project.

DOE completed an environmental assessment of the original proposed project in August 1997. Since then, the geographic scope and the design of the project changed, necessitating additional review of the project under the National Environmental Policy Act. The project now calls for the possible construction of up to 48 wind turbines on State and private lands. PSCo and its partners have initiated construction of the project on private land in Weld County, Colorado. A substation, access road and some wind turbines have been installed. However, to date, DOE has not provided any funding for these activities.

DOE, through its Commercialization Ventures Program, has solicited applications for financial assistance from state energy offices, in a teaming arrangement with private-sector organizations, for projects that will accelerate the commercialization of emerging renewable energy technologies. The Commercialization Ventures Program was established by the Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989 (P.L. 101-218) as amended by the Energy Policy Act of 1992 (P.L. 102-486). The Program seeks to assist entry into the marketplace of newly emerging renewable energy technologies, or of innovative applications of existing technologies. In short, an emerging renewable energy technology is one which has already proven viable but which has had little or no operational experience. The Program is managed by the Department of Energy, Office of Energy Efficiency and Renewable Energy. The Federal action triggering the preparation of this EA is the need for DOE to decide whether to release the requested funding to support the construction of the Expanded Ponnequin Wind Project.

The purpose of this Final Environmental Assessment (EA) is to provide DOE and the public with information on potential environmental impacts associated with the Expanded Ponnequin Wind Energy Project. This EA, and public comments received on it, were used in DOE's deliberations on whether to release funding for the expanded project under the Commercialization Ventures Program.

A public scoping statement describing the original project was sent on May 5, 1997 to interested members of the public and affected local, state and Federal government agencies. Three comment letters were received and were considered in the preparation of an EA completed in August 1997. Two key issues raised in those letters were 1) impacts to streams and wetlands, and 2) the need

for an impact monitoring and reporting program. A Pre-Decisional Draft EA was released for public comment. Three comment letters were received on the Pre-Decision Draft EA. The issues raised on the draft EA were: (1) the use of lattice towers (this issue was mitigated with the use of tubular towers on the Micon turbines selected by PSCo); (2) the need for an avian monitoring program (this was subsequently accomplished by PSCo with the establishment of an ongoing avian monitoring program); and (3) clarification in proposed displaced fossil fuel power generation (addressed in the final EA). DOE sent individual letters in response to those letters. Following consideration of all comments received and the information contained in the original EA, DOE issued a Finding of No Significant Impact for the project in August 1997.

A new public scoping statement was sent on January 13, 1999, to interested members of the public and affected local, state and Federal government agencies at the start of this process. Two comments were received during this scoping period. These comments have been considered in the preparation of the Final EA and in the Finding of No Significant Impact (FONSI) now being issued by DOE. The scoping letter, mailing list and copies of the two written responses received during this scoping period are reprinted in the Revised Final EA (DOE/EA-1277, December 1998). As a result of the expanded project activities, DOE determined that additional review and updating of the original assessment for the project was necessary before funding could be released. DOE requested public comment on a revised Pre-Decisional Draft Environmental Assessment. This document provided a detailed description of the expanded project along with an assessment of potential impacts associated with its construction and operations. Resources and conditions considered in this analysis include: streams, wetlands, floodplains, water quality, soils, vegetation, air quality, socioeconomic conditions, energy resources, noise, transportation, cultural resources, visual and land use resources, public health and safety, wildlife (including birds), threatened and endangered species, and cumulative impacts.

NOTE TO READERS

This Environmental Assessment (EA) is an update of a previously issued EA (DOE/EA-1221, August 1997). There are two items of significance that the reader should keep in mind in reviewing this document. These are:

- First, **this revised EA contains all of the text of the original EA, identified by regular type, and presents all new text in italics.**
- Second, **the EA considers the Ponnequin Wind Energy Project as including the maximum number of turbines that DOE can reasonably forecast at this time.** DOE has therefore analyzed the Ponnequin Wind Energy Project based on the potential for deployment of up to forty-eight (48) 750-kilowatt turbines with a combined output of about 36 megawatts, spread over parts of four sections of land. However, as of the issue date of this EA, DOE has been informed by the grantees that their present plans call for a wind farm size of forty (40) 750-kilowatt turbines with a total capacity of 30 megawatts.

CHAPTER ONE
INTRODUCTION

1.1 Purpose of this EA and the NEPA Process

The purpose of this environmental assessment (EA) is to provide the U.S. Department of Energy (DOE) and the public with information on the potential environmental impacts associated with the *Expanded Ponnequin Wind Energy Project* in Weld County, Colorado. This information has been used by DOE in its deliberations on whether to fund this renewable energy project under its Commercialization Ventures Program. This EA has been prepared in conformance with the following Federal regulations and guidelines:

National Environmental Policy Act (NEPA), (Public Law 91-190);
Council on Environmental Quality Regulations implementing NEPA (40 CFR 1500-1508);
DOE regulations governing agency compliance with NEPA (10 CFR 1021); and,
DOE Secretarial Policy on the National Environmental Policy Act (June 1994).

NOTE TO READERS

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This document reflects DOE's independent evaluation of the impacts associated with the proposed project. DOE approves and takes full responsibility for the scope and content of this document. An EA is not a decision document. DOE has issued a separate decision document on its decision to fund the expanded project following consideration of public comment on this EA and completion of the NEPA process.

Under the original EA a public scoping statement was sent on May 5, 1997 to interested members

of the public and affected local, state and Federal government agencies at the start of this process. Comments received during the scoping period were addressed in the preparation of an EA and Finding of No Significant Impact issued by DOE in August, 1997. The scoping letter, mailing list and copies of the three written responses received during that scoping period were reprinted in Appendix A of the EA (DOE/EA-1221, August 1997).

Since the August 1997 EA (DOE/EA 1221) was completed by DOE, the proposed project changed in several substantial ways. In brief, these changes included the following factors:

1. *Demand for electricity to be generated by the project appeared to be increasing at a rate not anticipated in the original project design and an increased number of turbines (up to 48 versus 27 - see Reader's Note above) could be needed to meet this demand.*
2. *The Zond turbine with a lattice tower originally proposed for Phase I installation was unavailable and a Micon turbine that uses a tubular tower was subsequently adopted.*
3. *A change in turbine spacing and layout became necessary to accommodate the turbine design and the increased number of turbines. These changes have resulted in a new turbine layout plan which, including a number of layout alternatives, identifies 48 potential turbine locations.*
4. *The new layout plan requires the use of adjacent State lands that were not explicitly considered in the original EA--other than in the avian impacts section.*

Given the substantial nature of these changes, DOE decided to prepare a revised EA and to issue a draft EA for public comment. For purposes of comparison, the revised EA on the Expanded Ponnequin Wind Energy Project incorporated the text found in the original (August, 1997) EA prepared for the Ponnequin Wind Energy Project. However, revisions and updates in the design and development of the project, and additional resource data collected since that time, are now provided in the revised EA. New information is provided in separate sections that have been italicized to set them apart from the text of the original EA. In this way the reader can see what aspects of the project have changed since August 1997, and compare the analysis of the Expanded Ponnequin Wind Energy Project to the original analysis.

The new public scoping statement was sent on January 13, 1999, to interested members of the public and affected local, state and Federal government agencies at the start of this process. Two comments were received during this scoping period. These comments have been considered in the preparation of the Final EA and in the Finding of No Significant Impact now being issued by DOE. The scoping letter, mailing list and copies of the two written responses received during this scoping period are reprinted in Appendix A of this EA (DOE/EA-1277, February 1999).

1.2 Project Background

DOE is considering a proposal from the State of Colorado Office of Energy Conservation which would involve the construction of the Ponnequin Wind Project in Weld County, Colorado by Public Service Company of Colorado (PSCo). The project has been named after the Ponnequin Camp--a feature shown on topographic maps of the area.

DOE has now considered a proposal to provide funding to the State of Colorado which could be used to help fund the construction of an Expanded Ponnequin Wind Energy Project. Funding will now be provided to the State of Colorado which would be responsible for disbursing funds to PSCo and/or other parties involved in the development of the project.

The State of Colorado Office of Energy Conservation has filed an application with DOE that requests funding for the development of the Ponnequin Wind Project and a Green Pricing Program under the DOE Commercialization Ventures Program. Under the terms of the grant to be negotiated with the Colorado Office of Energy Conservation, DOE could provide funds that could be used to finance construction of the Ponnequin Wind Project and marketing of its electricity under a Green Pricing Program. Under the program, PSCo would offer citizens and businesses the opportunity to purchase the electricity generated by the proposed wind project. The approval of the Colorado Public Utilities Commission was required before the project could proceed.

PSCo has initiated and proceeded with construction of the baseline project without receiving any DOE funds. DOE funding of the expanded project will now follow the issuance of this EA, the Finding of No Significant Impacts (FONSI), and the outcome of the DOE decision-making process.

PSCo and its contractor, Distributed Generation Systems (Disgen), would jointly develop the first phase of the Ponnequin Wind Project. The first phase would involve the construction of up to seven wind turbines. Disgen has been hired by PSCo to provide technical expertise on the planning, design and construction of the wind turbine facility. For purposes of this EA, reference to "PSCo" includes PSCo and Disgen, and any other project-related contractors, subcontractors and business partners involved in the development or operation of the Ponnequin Wind Project.

Disgen has sold its interest in the project to Ponnequin Acquisitions LLC who will be responsible for construction of the first seven turbines. PSCo, now a subsidiary of New Century Energies Company, and other New Century subsidiaries such as Utility Engineering, will be responsible for construction and operation of additional turbines beyond the initial seven.

On February 7, 1997, the Colorado Public Utility Commission approved the settlement of a case involving PSCo, the Colorado Office of Energy Conservation, the State Office of Consumer Counsel, the Land and Water Fund of the Rockies, the Colorado Renewable Energy Society, City

of Boulder, the Boulder Energy Conservation Center and the Sierra Club. The settlement allowed PSCo to charge a premium for electricity generated by a wind generation facility. Several citizen groups and consumer-owned utilities involved in the case have agreed to help PSCo market this renewable energy source to consumers. The settlement specified that PSCo will develop up to 20 megawatts (MW) of wind generation capacity if consumer demand warrants it. A potential grant for the project under the DOE Commercialization Ventures Program is referenced in the settlement. Assuming Colorado and PSCo eventually receive the referenced $3 million grant from DOE (which is dependent, in part, upon the results of this NEPA process), consumers would pay no more than an additional $2.50 for each 100 kWh block of wind-generated electricity they purchase.

The PSCo settlement specified that up to 10 megawatts of demand might be developed, and that an additional 10 megawatts (for a total of 20 megawatts) could be developed contingent on PSCo's evaluation of financial, technical, market and environmental considerations as well as the initial product's performance. Development of 20 MW of capacity would require approximately 28-29 of the Micon turbines; however, the original project area (three-quarters of Section 19 located in Weld County) can only accommodate 21 of these turbines. As denoted earlier, for the purposes of this EA, DOE has elected to look at the maximum long-range foreseeable potential for the Ponnequin wind site.

1.3 Purpose and Need for the Federal Action

The demand for electricity in Colorado is growing. PSCo anticipates a load growth of about 2 percent annually for the next five years. Firm, peak summer demand, for example, is expected to grow from 4,300 MW in 1996 to more than 4,700 MW in 2001. Electricity sales for PSCo are also predicted to increase from 23,600 million kWh in 1995 to 27,500 million kWh in 2001.

PSCo has revised its estimated load growth figures upwards since the original EA was released. In 1998, PSCo's total peak summer load was 4,700 megawatts, and is now expected to grow to 5,200 megawatts by 2001.

Assuming current generating capacity and fuel-mix, increasing the output of electricity requires increased burning of coal and/or natural gas.

The proposed project offers the potential to diversify energy sources and improve the prospects for commercializing wind energy technologies. The proposed project would be the first commercial-scale, wind energy facility in a Rocky Mountain state. If successful, the proposed facility could serve as a model for using wind power to meet growing demand for electricity without the need to expand conventional generating stations. Commercialization of wind energy could help meet the demand for electricity in rural parts of the U.S. and other countries.

DOE, through its Commercialization Ventures Program, has solicited applications for financial assistance from state energy offices, in a teaming arrangement with private-sector organizations,

for projects that will accelerate the commercialization of emerging renewable energy technologies. The Commercialization Ventures Program was established by the Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989 (P.L. 101-218) as amended by the Energy Policy Act of 1992 (P.L. 102-486). The Program is intended to assist entry into the marketplace of newly emerging renewable energy technologies, or the innovative applications of existing technologies. Generally, an emerging technology means one that a) has already been proven to be technically viable (i.e., it works) but which has had little or no operational experience, b) an innovative application of such technology has not been generally utilized, or c) a technology where experience has been limited to sub-commercial size or quantities, or to restricted or controlled operations or applications. In short, an emerging renewable energy technology is one which has already been proven to be viable but which has had little or no operational experience. The Program is managed by the Department of Energy, Office of Energy Efficiency and Renewable Energy. This proposed project was selected for potential funding by DOE for fiscal year 1997.

Due to changes in the design and scope of the project, and the need to complete a revised EA, a decision to release funding for the project had been delayed until the NEPA process has been completed. To date, no DOE funds have been provided to State or private organizations for the project. With the issuance of the FONSI, DOE has now decided to fund the project.

The Federal action triggering the preparation of this EA is the need for DOE to decide whether to release the requested funding to support construction of the *Expanded* Ponnequin Wind Project. By helping to reduce the premium consumers would pay for wind-generated electricity to $2.50/100 kWh, DOE funding could be critical to the successful introduction of wind power as a "green" energy alternative. Successful introduction of wind energy could lead to similar projects elsewhere in the region. Small wind power facilities could offer a more environmentally benign means of generating electricity which could reduce the reliance on fossil-fuel-fired facilities. The proposed facility could also test the commercial feasibility of using wind turbines to serve load growth in rural areas. In considering whether to fund this project through its Commercialization Ventures Program, DOE will assess its environmental impacts and benefits.

1.4 Regulatory Actions and Requirements

The DOE does not have regulatory authority over this project and as such would issue no permits for the project. Its primary involvement would be confined to financing in a portion of construction and assisting in the commercialization of the technology. However, in considering a decision to release funding for the project, the DOE has a responsibility under NEPA to assess the project's potential impacts.

DOE is responsible under NEPA to evaluate the substantial changes to the design, geographic scope and potential impacts of the project after the August 1997 EA was completed and the FONSI was issued.

Analysis of the Proposed Action assumes that PSCo would conform with all applicable Federal, state and local regulations. Regulations applicable to the project include those protecting cultural resources, Federally-listed threatened or endangered species and migratory birds, storm water quality, aircraft safety, egress from state and county roads, zoning and land use. Conformance with regulatory and permit requirements would reduce the potential adverse impacts associated with the project. Regulatory requirements and their effect on reducing adverse impacts are discussed in this EA. For example, before construction of the turbines can begin, a Special Review Permit must be received from Weld County. This permit process includes a public hearing before the County Planning Commission. The process also requires the notification of adjacent landowners by letter and notification of the public through notices in local newspapers. The intent of the permit process is to ensure the proposed changes in land use occur in an orderly manner and do not create adverse impacts on local residents and lands. The County must also issue a building permit for the project and the states of Colorado and Wyoming must allow equipment and vehicles to travel across state lands.

To date applicable permits for the project have been received and PSCo and its partners are proceeding with construction of the first 21 turbines. A substation at the site has been completed and an existing access road has been graveled to permit the passage of trucks and heavy equipment. PSCo has also applied to the Colorado State Board of Land Commissioners for permission to expand the project into adjacent State lands. The State Land Board has approved this expansion, and is currently negotiating with PSCo on the terms of agreement for the lease of the adjacent State lands to PSCo. Access easements from a private landowner and permission from the states of Colorado and Wyoming to allow equipment and vehicles to travel across state lands were also necessary.

1.5 Public Involvement

DOE issued a Notice of Public Scoping on May 5, 1997 to request public comment on issues and concerns that should be addressed in this EA. Notices were sent to intervenors in the Colorado Public Utility Commission case, affected and adjacent landowners, citizen groups, and officials of affected Federal, state and local government agencies. Appendix A provides a list of parties contacted. Three letters and one telephone call were received in response to the scoping letter. The letters are reprinted in Appendix A. None of the letters requested a public meeting or hearing on the project. The telephone call from the Bureau of Land Management, Rawlins Wyoming District Office, was to request a copy of the EA when available. Apart from issues mentioned in the scoping letter, two key issues raised in those letters were 1) potential impacts to streams and wetlands from excavation or filling activities, and 2) the need for an impact monitoring and reporting program.

As part of its own site selection, planning and environmental permitting efforts, PSCo also contacted the following parties: the Western Area Power Administration, Weld County Planning Department, Weld County Tax Assessment Department, Weld County Attorney's Office, Lazy D Grazing Association, the Terry Grazing Association, the U.S. Fish & Wildlife Service, Colorado

Division of Wildlife, the Wyoming State Land Office, the Wyoming Governor's Office and the

expressing an interest in the project.

The project has been the subject of many articles in local papers. Opportunities for public

Commission Meetings. Citizens were also given the chance to comment on the project as part of Weld County's Land Use Permit process.

revised environmental assessment and requested additional public comment on the project.

CHAPTER TWO
PROJECT DESCRIPTION

2.1 Proposed Location

PSCo identified the site for the proposed wind project following a wind monitoring study and consultation with landowners, officials of Weld County, the Colorado State Office of Energy Conservation and the Colorado Division of Wildlife (CDW) and the U.S. Fish & Wildlife Service (USFWS). The CDW and USFWS were consulted about potential impacts on raptors, migratory birds, threatened, endangered and candidate species.

The wind project would be located approximately four miles east of Interstate 25 and 1.5 miles west of U.S. Highway 85 (Figure 2-1). The nearest large town is Cheyenne, Wyoming located approximately 10 miles to the north-northeast on Interstate 25. Various roads from Interstate 25, State Highway 223 and U.S. Highway 85 can be used to reach the project area; however, the preferred route was to access the project area from Highway 85. However, a private landowner's refusal to provide access has meant that the preferred route cannot be used. Instead, access would be from State Highway 223. The need for minor road improvements (e.g., gravel, and some blading) would be coordinated with affected landowners. Figure 2-1 shows the proposed wind project site and vicinity.

The project expansion area incorporates portions of the three sections of State land adjacent to the existing project area: Sections 20 and 30 in Township 12 North, Range 66 West; and Section 24 in Township 12 North, Range 67 West (Figure 2-1). No private land is involved in the project expansion area or to access to the expansion area. No changes in permitted access have occurred in the past year. Access to the project site continues to be from a gravel ranch road connected to Highway 223 whose construction predated the project.

Gravel has been applied to this access route and gates installed where necessary. Some minor blading has been required. The road width is approximately 12 feet. Otherwise no improvements have been necessary. Existing roads can be used to access the expansion area. No new access road construction would be required as a result of the project expansion.

The wind project would be located on private land in Weld County, Colorado within Section 19 of Township 12 North, Range 66 West. Adjacent lands are owned by the Terry Grazing Association, the Lazy D Grazing Association, the State of Colorado and the State of Wyoming. No Federal land is involved or would be affected. The project area within which the wind turbines, two meteorological towers and an electrical substation would be installed encompasses 416 acres. The project area is on a mesa of high plains rangeland currently used for cattle grazing and feeding. The mesa is approximately 6,300 feet above mean sea level. For reference, lands along U.S. Highway 85 are about 6,000 feet above mean sea level. Figure 2-2 provides a

schematic view of the project area and shows the proposed location of the turbine string, two meteorological towers, (an existing meteorological tower that would be removed) and the substation. Two existing high voltage transmission lines are found along the eastern boundary of the project area are also shown. Outbuildings and a small windmill for a cattle feeding operation were the only structures found on the site until a meteorological monitoring tower was installed in September 1996.

As of late, two meteorological towers and one turbine have been installed on the original site. A cattle feeding operation has continued on the site. Some additional fencing has been installed to manage construction traffic and protect cattle.

A 30-year easement for the wind project area has been obtained from the property owner. The project area and possible access roads have been reviewed by a construction company. No unusual characteristics which would complicate access or construction activities were identified.

The expanded project will require construction of wind turbines on adjacent State of Colorado lands administered by the State Board of Land Commissioners. The Board would have to grant PSCo permission to construct turbines on State lands. Access to these state lands would use the existing project site and the existing access road. No new access road would be required and no additional private lands are involved in the expansion. Primitive two-track trails would continue to be used to access individual turbine sites. A 53-year easement for the wind project area has now been obtained from the property owner.

Lands within the expansion area have been nominated for inclusion in the State Land Board's Stewardship Trust. One of the original purposes of the State Trust Lands was to generate revenues for public schools either through the sale/disposal or leasing of State lands. Rather than disposal or maximizing revenue, the purpose of the Stewardship Trust is to protect lands that could be more valuable to the State in the future. Lands within the Stewardship Trust can be used for wildlife, recreation, grazing, oil and gas production or other uses as approved by the State Land Board. Proposed and on-going activities at the site are not inconsistent with the designated uses for land within the Stewardship Trust.

Figure 2-1. Map of Project Area and Vicinity

NOT AVAILABLE ELECTRONICALLY

Figure 2-2 Map of the Project Area with Turbine Locations and Facilities

NOT AVAILABLE ELECTRONICALLY

Figure 2- 2R Revised Map of the Expanded Project Area with Turbine Locations

NOT AVAILABLE ELECTRONICALLY

2.2 Existing Activities and Development

Two transmission lines operated by the Western Area Power Administration (WAPA) form the eastern boundary of the project area. WAPA has indicated its willingness to allow interconnection to one of the lines. Various roads from Interstate 25, State Highway 223 and Highway 85 approach or enter the project area. No power lines, substations, oil and gas wells or other energy facilities are found within the project area. A 140-foot meteorological tower for sampling wind conditions at the project area was installed in September 1996. The only other structures found in the project area are a windmill and storage and outbuildings associated with the current landowner's cattle feeding operation (see Figure 2-2). The closest occupied residence is found approximately 1.5 miles southeast of the project area. The nearest commercial establishment is located approximately two miles east on U.S. Highway 85.

The project site has been expanded. Private lands now form the boundary on the east, west and south sides of the expanded project site. The Wyoming-Colorado border forms the northern boundary of the project site. No construction is slated within the State of Wyoming; however an existing ranch road in Wyoming is used to access the site. No new residences or commercial establishments have been constructed closer to the site in the past year.

Since August, 1997 the following developments have occurred at the original site: construction of a substation at the corner of the property and the WAPA power lines; connection of that substation to existing WAPA power lines; graveling of ranch roads to access the project site and substation; installation of a second meteorological tower; installation of 21 Micon wind turbine that employs a tubular tower; construction of foundations for additional turbines; installation of a buried cable linking the substation with the first turbine; reclamation of a road that was realigned to avoid a swale; and the installation of some additional livestock fencing. No federal funds have been used in these developments. No developments have occurred on the adjacent State lands that comprise the expansion area.

2.3 Proposed Action

The Proposed Action represents a reasonably foreseeable development scenario based on a recent agreement reached among PSCo, citizen groups and the Colorado Public Utilities Commission. Federal regulations (e.g., 40 CFR 1500.2) stress avoidance or minimization of possible adverse effects on the quality of the environment. While the Proposed Action is intended to avoid and reduce impacts otherwise associated with conventional forms of energy production, it also incorporates measures intended to reduce potential, adverse impacts resulting from this project.

The scope of the project has changed in the past year due to unforeseen circumstances. The project site has been expanded to include contiguous State land on the top of the mesa where construction is now occurring. The proposed maximum number of turbines considered under this EA has increased from 27 to 48. The proposed number of turbines within the original project site has decreased from 27 to 21. The spacing between turbines and the layout of turbine

strings has been changed. This has been due, in part, to a change in the model of the proposed turbine. In addition, the design of the tower to be used in Phase I has been changed from the proposed lattice tower to a tubular tower. However, it is possible (although unlikely) that Phase II, and beyond, could use the lattice tower design.

Actual size of the project will depend upon the actual price premium and customer sign-ups. Based on market surveys conducted by PSCo, it is estimated that consumer demand ultimately could justify building up to 22 MW of wind turbine capacity in the project area--assuming the price premium was reduced to $0.025/kWh or less. The Colorado Public Utilities Commission has approved the operation of a 20-MW facility. To date, sign-ups for the program would justify construction of at least seven turbines.

Customer subscription rate warrants construction of at least 21 turbines. At the present time, expanding demand for wind-generated electricity appears to justify the construction of at least 15 megawatts of capacity. However, as previously indicated, this EA examines the maximum projected potential for the Ponnequin wind site.

2.3.1 Wind Turbines

PSCo anticipates using the Zond Z-46 or a similar turbine. The Z-46 is a 750-kW wind turbine whose blades turn at a relatively low number of revolutions per minute (rpm)--approximately 32 rpm. The reduced rpm increases the visibility of the blades. The Z-46 is a relatively new turbine design that has undergone 500 operating hours of testing.

A four-leg lattice tower would be used to support the turbine and rotor (Figure 2-3). The tower itself would be 164 feet tall. To discourage birds from nesting or perching in the tower, its cross-members would be sharply angled and no horizontal cross-members would be used. The tower itself is sharply tapered as shown in Figure 2-3. This design is different from the Kenetech 60-foot lattice tower used in the Altamont Pass wind project in California which incorporated horizontal cross members and is a tower frequently referenced in the literature on avian impacts. The diameter of the rotor blade assembly, which would be mounted on top of the lattice tower, would be 151 to 164 feet depending upon the actual blade configuration used. Thus, the total height of the turbine structure with blades would be 244 to 251 feet. Turbines would be spaced (as shown in Figure 2-2) so that the turbulence created any given unit does not affect the operations of a nearby unit. The wind turbine system would be delivered to the site in major subassemblies consisting of the tower, turbine, blades and electronics cabinet. The tower itself would be hauled to the site as partially-assembled kits on semi-trailer trucks. Use of these kits would reduce on-site construction time and cost.

Due to a variety of difficulties in procuring the Zond turbine for Phase I, PSCo is now installing Micon 750 kW turbines at the original site. Overall dimensions of the Micon are similar to the Zond but the Micon can be somewhat taller. For example, rotor blade diameter of the Micon is 158 feet. The Micon tower's height (to the hub of the rotor) is between 147.6 and 180.5 feet.

Total height including the rotor is between 226.7 feet and 259.5 feet. At their lowest point of travel, the blade tips are between 68.6 and 101.5 feet above the ground. The blades rotate at a speed of 15 to 22 revolutions per minute. Total weight of the Micon is 72 tons. It is possible that for Phase II and beyond PSCo could use the Zond turbines with a lattice tower design.

The Micon blades and generator assemblies are mounted on a white, tapered tubular tower. Access to the rotor and turbine assembly is by a series of ladders and platforms within the tower The tower itself comes partially assembled in three sections with electrical cables already installed. A small-skid mounted transformer is installed outside, next to the tower. The electronics and monitoring equipment are installed within the base of the tower. Assembly of the tower, blades and turbine requires only a few days. Spacing of the turbines has been set to minimize turbulence and interference among units. The exact specifications of the Micon can vary to meet specific site or operating conditions.

The tubular tower itself offers no perch sites for birds or raptors. The turbine assembly is covered with a smooth housing (nacelle) that offers minimal perch sites.

At each tower site a truck-mounted drilling rig would be used to drill four holes which would be filled with reinforced concrete. The four legs of the lattice tower would then be bolted to these concrete piers. The location for these foundations would be graded as necessary to create a level working surface. An area approximately 20 feet by 20 feet could be graded at each tower location. Grading of lay-down and staging areas would not be necessary due to the generally flat nature of the terrain. No areas would be graded or graveled for parking areas at turbine sites. PSCo intends to minimize surface disturbance associated with the project, in part, to reduce scars and the need for extensive reclamation and to reduce the attractiveness of disturbed areas to burrowing rodents. No fencing would be installed around the tower.

For the Micon turbines, a solid 30 feet by 30 feet square reinforced concrete foundation is required to support the tubular tower. Most of the foundation is below grade with only a concrete collar the diameter of the tower visible on the surface. The base of the turbine is attached to this collar. Grading of the site is not required. Due to the flatness of the mesa top, no grading of the construction and assembly areas is required either. No fencing has been installed or will be necessary around the tubular towers. The access door into the tower can be locked to prevent unauthorized access to the electrical and control panel. According to a spokesperson for Micon, rodents typically have not been a problem or threat to electrical cables within the towers. No rodent burrows were observed along an existing power line trench installed in the past year.

Figure 2-3 Schematic of the Proposed Wind Turbine

NOT AVAILABLE ELECTRONICALLY

Figure 2-3R Revised Schematic of the Proposed Wind Turbine

NOT AVAILABLE ELECTRONICALLY

Once the tower has been built, specially trained rigging crews would install the turbine and blades. Electronics would be installed and interconnected to underground cables that would gather output from individual turbine sites. Once a turbine has been constructed, it would undergo a variety of tests to ensure its mechanical and electrical systems are operating correctly.

A large crane is used to assemble the tower and to lift the turbine and rotor assemblies into place. Micon has been performing mechanical and electrical system checks at the site.

Based on estimated wind availability, typical wind speed frequency distributions, a typical power curve, and the characteristics of the turbine, PSCo has estimated that over the course of a year one turbine could generate the electricity equivalent to the average annual electricity consumption of 244 Front Range households. As proposed, the project calls for the construction of up to 27 turbines within the 416-acre project area with an estimated capacity of about 22 MW.

The expanded project identifies 48 potential sites for the installation of wind turbines. The existing substation is designed to handle up to 30 MW.

2.3.2 Roads

Access Road. The proposed route into the project area uses existing ranch roads which connect to State Highway 223, the Terry Ranch Road, and Interstate 25. (See Figure 2-1 but note that all roads are not shown on the topographic base map). Ranch roads would require minor improvements such as gravel, leveling of a high center, or installation of a culvert to make them temporarily suitable for construction trucks and traffic. Access roads would be improved to only the minimum condition necessary to allow passage of vehicles and equipment required for facility construction. No crown-and-ditch roads (engineered roads with side-ditches, shoulders, etc.) are proposed.

Improvements and maintenance of existing roads have been consistent with this description.

While not the shortest route into the project area, this route is proposed because, unlike other shorter routes (e.g., see the "preferred route" shown in Figure 2-1), landowners along this route have expressed a willingness to grant the necessary access. The junction with State Highway 223 would be upgraded as necessary to meet conditions set by the Wyoming Department of Transportation. The proposed access road would require approximately 0.2 miles of new road corridor--primarily to connect the project area with existing ranch roads. PSCo proposes to keep the access road width to about 12 feet and to the minimum condition necessary that allows for passage of construction vehicles.

The proposed route has been followed. Some minor realignment to a ranch road within the original project section was necessary to avoid an area where snow tends to collect. This area was reclaimed and revegetated to the landowners' satisfaction.

Light truck traffic (e.g., pickup trucks) on the access road is expected to peak at 60 vehicle-trips per day during construction and decline to about 1-2 vehicle trips per day once the facility is operational. Heavy truck traffic, which would include flatbed trailers and cement trucks, would peak at 20 vehicle-trips per day during construction. No heavy truck traffic would be associated with day-to-day operation of the project.

This scenario represents a maximum traffic level likely to occur. Such traffic levels are only likely during the few days when actual lifting and installation of the towers, rotors and turbines occurs.

Service Roads to Turbine Sites. No new improved (e.g., crown-and-ditch) roads would be constructed to reach individual turbine locations. Roads used to reach turbines would remain as two-tracks suitable for travel by a pickup truck or four-wheel drive maintenance vehicle. The flat terrain of the project site and its well-drained soils permit this type of use by the current landowners year-round.

Proposed and on-going activities at the site are consistent with this description.

2.3.3 Feeder Lines and Communication Cables

Buried, insulated feeder lines (25 kilovolts (kv)) would connect the turbines to step-up transformers and the substation on the 115 kv WAPA transmission line (see Figure 2-2). These trenches would also contain communication lines. Surface disturbance from construction of the four-foot deep trenches would be about four feet wide. The trench-line would not require grading. Once the cables are installed, the trench would be backfilled and the surface reclaimed and revegetated. No overhead lines or poles for feeder lines or new high-voltage transmission lines would be required.

Project activities have been consistent with this description. The actual, observed width of disturbance associated with trenching-in power cables has been approximately two feet. In the future, trenches would also incorporate telephone lines required to remotely monitor turbine operations and performance from one or more off-site monitoring centers.

2.3.4 Auxiliary Equipment and Buildings

Currently there is a 140-foot meteorological tower within the project area. As proposed, this tower would be dismantled and two new meteorological towers installed. The new towers would be approximately the same height as the turbine towers and would be installed at locations (see Figure 2-2) more suitable for monitoring wind conditions driving the turbines. An automated supervisory control and data acquisition (SCADA) system would be installed to collect and transmit performance data on the facility. Data would be made available to DOE. No maintenance buildings or offices are proposed for construction within the project area. Spare parts and maintenance supplies for the turbines would be stored at a facility in Cheyenne, WY.

The original meteorological tower has remained in place and a second tower has been installed. Temporary storage sheds and a portable office trailer for use during construction have been installed adjacent to the fence of the substation. Implementation of a remote monitoring system is awaiting installation of reliable telephone lines. The current cellular telephone system used for this purpose has not been reliable. A hard-wire, telephone communication link with the site will eventually be installed to support the SCADA system.

2.3.5 Interconnect Substation

PSCo would construct a substation where the feeder lines would interconnect with the existing 115 kv line owned by WAPA. The approximate location of the proposed station is shown in Figure 2-2. The site would be located slightly south and uphill from a small depression found at the northeast corner of the project area. The layout of the substation site is shown in Figure 2-4. A single-story, 20-feet by 28-feet control building would be located within fenced area of the substation. It would contain various equipment related to operation, monitoring and control of the wind facility and substation.

The substation has been constructed and is similar in appearance and dimensions to that shown in the original EA (Figure 2-4). A small area (about six foot square) just west of the substation has been fenced and was used for the installation of a system of electrical controls.

The substation would require line breakers, meters and various other pieces of equipment typical for such a station. The station would be locked and surrounded with a chain link fence and topped with barbed wire to discourage entry. A sign on the fence would provide safety warnings and an emergency contact telephone number. The substation connection must be completed in 1997 before the turbines can come on line. The project would not require any upgrades to any existing transmission or distribution lines.

Additional skid-mounted transformers that sit on the ground would be installed near the base of turbine towers. Consistent with the description above, no new above ground power lines or telephone lines have been constructed and existing lines or towers have not been upgraded.

2.3.6 Project Stages and Timing

Construction of the first turbines is scheduled to commence in September 1997 and to be completed by the end of the year. Construction of the interconnect substation could begin in August or September 1997 prior to construction of the turbines. Access road improvements and service road construction would proceed prior to installation of the turbines. Installation, testing and final adjustment of new turbines would take approximately 90 days for each phase but could take longer, depending upon weather and test results. As proposed, up to seven turbines would be installed in the first phase to be completed by the end of 1997. Another 6-7 turbines would be installed in 1998 depending upon consumer demand. Installation of additional turbines at this site beyond the first seven would depend upon a variety of factors, including: customer demand for

the “green energy” product, actual performance of the turbines at this specific site, construction and operations costs, and the results of avian impact monitoring (see Appendix B).

In 1997-1998 consumer demand for wind-generated electricity quickly reached a level that would justify PSCo proceeding with the construction of up to 21 turbines within Section 19. The schedule for the construction of additional turbines beyond the 21 is uncertain and will be dependent upon future consumer demand.

Figure 2-2 shows approximate locations for the proposed turbines. Final locations could be adjusted to reflect the results of avian impact monitoring and additional wind monitoring data. No construction problems (for example, problem soils) which would require relocation of turbines or other facilities are likely to occur. Locations have been ranked according to project stages. Stage I locations include those which would be used in 1997 for the first seven turbines. Stage II-III locations include those most likely to be used for turbines which would be installed in 1998 and in later years. Stage IV locations would be the last locations used in a build-out of the project area. Stage IV locations would be adjusted as necessary to avoid a draw, steep slopes and potential impacts to raptors that might be identified by avian monitoring. It is possible that substitute Stage IV locations could be identified in other portions of the project area (e.g., SE 1/4, NE 1/4) once additional, site-specific data of factors affecting turbine spacing and location, such as turbulence from installed turbines, has been gathered.

An updated version of Figure 2-2 shows the potential locations for up to 48 wind turbines. Construction and operation of turbines within the original project site is proceeding at this time. Construction of all turbines within the original site area is likely to occur before construction activities move into the expansion area.

It is estimated that the initial seven turbines would generate approximately 5 MW of electricity. Depending upon actual operating conditions, about 27 turbines would be required to meet the 22 MW of demand. The turbines have been designed for a thirty-year life span and a thirty-year easement for the project has been obtained from the private landowner.

A revised estimate of turbine performance now indicates that 21 turbines would be necessary to supply approximately 15 MW of electricity

Construction activities would be scheduled each year to avoid nesting mountain plover and/or nesting raptors identified by field surveys (see Section 2.3.9). No nesting raptors or nest structures were found in the project area during a Spring 1997 raptor survey completed for this EA; nor were any nesting plover located during field studies conducted in Spring 1997 for this EA (Reeve, 1997). Additional discussion of these species may be found in chapters three and four.

Results of additional avian monitoring completed in 1997-1998 can be found in chapters three and four.

Figure 2-4 Layout of the Proposed Substation Site

NOT AVAILABLE ELECTRONICALLY

2.3.7 Project Work Force

PSCo and its partners or contractors would be responsible for the completion of construction activities, including installation of the wind turbines. Disgen, in consultation with the turbine manufacturer, would have direct responsibility for overseeing construction of the wind turbines while PSCo itself would manage construction of the substation and interconnection. A maximum of about 60 workers would be on-site. Due to the short construction period (e.g., about 90 days), no personnel are expected to permanently relocate to Colorado as a result of this project.

The turbine manufacturer would provide operations and maintenance training to project personnel or would provide some or all of these services on a contract basis. It is anticipated that current employees of a PSCo subsidiary in Cheyenne, Wyoming would be used to operate and maintain the facility as appropriate. PSCo anticipates that the facility would create no new permanent positions.

Ponnequin Acquisition, LLC, is responsible for installation of the first 7 turbines. PSCo and Utility Engineering (a PSCo subsidiary) have taken responsibility for the installation of turbines beyond the first seven. The estimated number of workers typically found on site will be less than sixty. With the exception of technicians from Micon, workers have been drawn from the regional workforce.

2.3.8 Operations and Maintenance

The turbine manufacturer would provide 24 hour consultation services and dispatch a technician to the site within 48 hours once notified by PSCo. It is expected that turbine maintenance activities would consist of checking the lubricating oil on an annual basis. In general, it will not be necessary to change the lubricating oil more frequently than once every five years unless metal shavings are present. The turbine unit is equipped with oil filters and these would be changed during routine maintenance. All used oil would be placed in closed containers and taken to an oil recycling or permitted disposal facility.

Once adequate telephone lines are installed, Micon would have the capability of monitoring turbine performance and operations from its offices. It is estimated that a Micon technician can be dispatched to the site within 48 hours. PSCo personnel can be dispatched to the site in a matter of a few hours on an as needed basis.

Once commercial operations begin, the wind project would be unmanned but would be visited by a maintenance person on an as needed basis, probably not more than once a week. A supervisory control and data acquisition (SCADA) system would be installed to collect and relay data on turbine output and other performance parameters. Turbine operations and maintenance needs would be monitored by the manufacturer. Facility output, performance and operations would be monitored by PSCo at an off-site location. Given that it would be the first commercial wind turbine facility in Colorado, it is possible that the project would be monitored by several different

organizations from a variety of locations. However, control of project operations would be limited to PSCo and its partners and contractors. In the case of extremely high winds or reports of a tornado in the vicinity, PSCo could shut down the turbines. Operations and maintenance personnel would be informed of environmental protection measures discussed in Section 2.3.9 and elsewhere in this document. PSCo would be responsible for monitoring project operations and maintenance staff to ensure the successful implementation of all measures discussed in this EA.

Current proposed activities are consistent with this description.

2.3.9 Proposed Environmental Protection Measures

PSCo has proposed to implement environmental protection measures specifically designed to minimize or avoid environmental impacts associated with construction and operation of the wind project. A brief description of these measures is provided below.

Risk-Reducing Site Selection Criteria. Apart from its excellent wind characteristics, the project area was proposed because it incorporated features which would reduce environmental risks, especially risks to wildlife and avian species. A discussion of alternative sites and site selection criteria is found in Section 2.5.1 of this EA.

Current proposed activities are consistent with this description.

Land Use Compatibility. PSCo would comply with the conditions of approval attached to Weld County land use and building permits.

PSCo would also be required to comply with the conditions of approval attached to a permit to use State lands in the expansion area. Existing land uses (such as cattle grazing) could continue during facility construction and operations.

Low RPM Turbine. PSCo has chosen a turbine which would operate at a relatively low rpm. Because a lower rpm blade tends to be more visible, PSCo expects this could help to reduce the potential for avian strikes.

The Phase I Micon turbines operate at an even lower (15-22) rpm than the Zond turbines (32 rpm) that were originally proposed by PSCo.

Visible Turbine Blades. The Kenetech Windpower Avian Research Program has established criteria for a special white paint ("raptor white") that would be used on turbine blades to provide the highest level of contrast across the complete spectrum of raptors' vision--including the ultra-violet end of the spectrum.

The Micon turbine towers and blades now on site are painted with a high visibility white paint.

Lack of Horizontal Perches. The proposed lattice tower design incorporates sharply-angled cross-members which should provide a less suitable perch site for species of raptors found in the region (Hunt, 1995). The proposed lattice tower has no horizontal, widely-spaced crossbars unlike those found on older lattice tower designs commonly referenced in the avian impacts literature.

The Phase I turbines use a tubular tower that provide virtually no exterior perches. All ladders are within the tubular tower. The generator housing is a smooth, streamlined design that offers only minimal perch sites. However, it is possible that in the Phase II and beyond the project could include of a lattice tower design as discussed in the original EA.

Protection of Nesting Birds. Due to the potential for mountain plover to nest in the project area, future surface-disturbing activities would not be conducted between April 15 and July 31 each year until after a field survey has been completed and the presence or absence of nesting plover verified. Similarly, the project area would be surveyed and the presence or absence of nesting raptors in the vicinity of proposed construction activities verified. PSCo would consult with the U.S. Fish & Wildlife Service and the Colorado Division of Wildlife regarding raptor and/or mountain plover nests located during such surveys and appropriate protective measures. Construction activities would be scheduled each year as necessary to avoid impacts to nesting raptors and mountain plover identified in field searches.

The expanded project and current activities are consistent with this description. The proposed surveys have been concluded with the results being incorporated into Chapters 3 and 4 of this EA.

Removal of Carrion. PSCo would work with local landowners to ensure the prompt removal and disposal of carcasses and carrion that could attract raptors to the project area or access road where the risk of a fatality would be greater.

Since the original EA was completed, the attraction of raptors to the project area does not appear to have been a significant problem.

Protection of Existing Land Uses. PSCo fully intends to cooperate with local landowners to allow continued use of the area for cattle feeding and ranching operations. This ongoing level of human activity would maintain a current environment that provides little wildlife habitat and is relatively inhospitable for avian species--especially those sensitive to human disturbance during the nesting period. Thus the lack of cover, trees, shrubs or natural roost and perch sites within or adjacent to the project area also would be maintained.

Cattle feeding operations have continued during construction and installation of the turbines. Only minimal perching opportunities for raptors and other birds have been added to the project area as a result of construction activities. Herds of antelope have continued to use the project area as well. No change in prey base (e.g., invasion by prairie dogs, ground squirrels) attractive

to raptors is evident. Grazing of cattle on adjacent State lands could continue during construction and operation of the Expanded Ponnequin Wind Energy Project.

Hazardous Materials. No materials found on the *List of Extremely Hazardous Substances and Their Threshold Planning Quantities,* defined in 40 CFR 355 (as amended) would be used. No PCBs or substances regulated by the Toxic Substances Control Act would be used in the project. PSCo would review substances to be used during construction and operations in light of the Environmental Protection Agency's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986* (as amended) to determine whether materials proposed for use qualify as hazardous substances. Hazardous materials would be used, stored, and disposed of in an environmentally safe manner according to State and Federal regulations. Materials such as paints, lubricants, oils and vehicle fuels would be located, handled, stored in containers, and disposed in a manner that avoids contamination of soil or water. PSCo's spill response procedures would be initiated should an accident occur.

The expanded project and current activities are consistent with this description.

Noxious Weed Control. Noxious weed infestations on areas disturbed by proposed construction activities would be controlled by mechanical, chemical, biological or other methods. Weed control measures would be developed in consultation with the affected landowner and Weld County.

These measures would be applicable to the expanded project as well.

Reclamation of Soils and Vegetation. Areas disturbed during construction which are not needed for facility operations or maintenance would be reclaimed. Seeding would occur in either the early spring or fall to take advantage of available moisture. PSCo would consult with the landowner and the Natural Resource Conservation Service (formerly, the Soil Conservation Service) to select a seed mixture adapted to the area's climate and one that requires no supplemental watering.

Reseeding of reclaimed areas in 1998 around the substation and an abandoned road has been successful and satisfactory to the landowners.

Erosion Prevention. Runoff from the 0.9 acre substation site would be directed and controlled such that it would not promote sedimentation of natural channels or down-cutting of new channels. The project would comply with Colorado Department of Health regulations and permit requirements for control of sediment and storm water runoff from construction sites.

Existing activities have been conducted consistent with this measure.

New surface disturbance, and thus erosion potential, would be minimized by using existing two-track roads for all but 0.2 miles. PSCo proposes to limit road improvements to these existing two

tracks and the 0.2 miles of new access road. No wetlands are found in the project area nor would any wetlands be crossed by new access road. The access road would be graveled as necessary to stabilize its surface and minimize rutting. Culverts would be sized and placed as needed along the existing road to improve drainage and maintain natural patterns of runoff. If outfalls for new culverts are needed, they would be lined with rock or otherwise designed and located to minimize down-cutting and soil erosion.

To date project activities appear to have been consistent with this description. Improvements to existing ranch roads have been kept to the minimum necessary to access the site. While it is possible that the access road could become temporarily impassable to a standard passenger car, access roads have been kept at a primitive level that still allows for truck traffic.

Waste Management. The project would produce no liquid effluent. All sewage at construction sites would be contained in portable toilets and disposed at a permitted facility. No manned facility requiring sewage or water services has been proposed. Construction debris would be collected in closed containers and sent to a permitted disposal facility. Routine trash would be collected and disposed of at a permitted disposal facility.

Because the site would be unmanned, waste generation is expected to be negligible once construction activities have been completed.

Cultural Resources. A cultural resources survey was conducted to locate any cultural resources within the project area potentially eligible for listing on the National Register of Historic Places (Tate, 1997). None were found. Completion of the cultural resources survey was intended to ensure compliance with requirements of the National Historic Preservation Act (36 CFR 800). Results of the survey are discussed in chapters three and four. The proposed access road is an existing two-track which crosses an old railroad grade. If leveling or grading of the two-track is necessary in the vicinity of the old railroad grade, it would first be checked for cultural resources.

Results of a cultural resources survey in the expansion area--completed in 1998--are described in chapters three and four. PSCo would avoid three sites identified in this survey as potentially eligible for listing on the National Register of Historic Places and would take measures, such as fencing, to protect these sites from adverse impact during construction activities.

Socioeconomic Benefits. PSCo intends to use local contractors and personnel to the extent feasible. Disgen, assisting PSCo in project design and implementation, is a Colorado-based company. PSCo and its contractors would pay Colorado sales and use taxes as required.

PSCo is now being assisted in the initial installation of the first seven turbines by Ponnequin Acquisitions, LLC. Otherwise, PSCo and its contractors, suppliers or subsidiaries are completing all other work.

Public Health and Safety. In accordance with Federal Aviation Regulations (14 CFR 77.13),

an Application to Construct would be filed with the Federal Aviation Administration (FAA). The FAA has issued an advisory circular on marking and lighting of potential aircraft obstructions including wind turbines (FAA, 1996). FAA guidelines allow for flexibility in the type of lighting and marking that can be used. Final decisions on marking and/or lighting requirements for the turbine structures rests with the FAA. Compliance with FAA requirements would ensure that the project presents a minimal threat to aircraft.

To comply with FAA requirements, a white flashing beacon visible in the daylight has been installed on the top of the turbine housing which is at the center, or the hub, of the turbine blades. No painting of the blades or blade tips has been required. At night, the beacon at the hub of the blades changes to a red, flashing beacon. Not every turbine will necessarily require the beacon light. For example, every other turbine in a string may be required to have a beacon.

Existing electrical equipment associated with the substation and some small pole-mounted switching equipment will be examined to identify possible threats of electrocution to birds or intruders. Where feasible, measures will be taken to shield or insulate exposed electrical terminals to reduce this threat.

Construction and Post-Development Impact Monitoring. PSCo has developed an avian impact monitoring program (see Appendix B). The plan incorporates ongoing consultation with Federal and state agencies regarding project development and impacts to identify any additional impact mitigation measures that could be needed. Sampling and observations would be conducted by qualified professionals (see Appendix B) in accordance with good scientific practice as recognized in the biological and impact assessment literature. Data would be recorded in accordance with protocols based on experience at other wind sites. Data would be shared with Federal and state agencies and the public. In brief, the objectives of the impact monitoring program would be: 1) to monitor avian use of the project area; 2) to determine whether lattice towers are (not) being used for perching; 3) to continue the surveys of raptor nesting in the vicinity which were conducted Spring, 1997 (Reeve, 1997); 4) to monitor whether project activities may have increased the presence of raptor prey species such as rodents; 5) to monitor and report any avian deaths in the vicinity of installed turbines, and 6) to identify any additional impact mitigation measures that may be needed.

Monitoring of avian use of the project area continued following completion of the August 1997 EA. This monitoring has continued following completion of one turbine tower and during the construction of additional turbines.

For example, it will be important to monitor whether the wind turbines are attracting raptors, other birds or raptor prey species to the site. If surveys indicate increased perching activity in the project area, the USFWS and CDW as well as experts on avian impacts, would be consulted regarding the development and installation of measures to discourage birds from perching and to avoid their becoming acclimated to the turbine towers. Because avian fatalities are statistically rare events at wind projects, and because knowledge of what conditions contribute to collisions is

scarce, as much data as possible will be collected if a fatality occurs. All data regarding bird fatalities would be provided to the CDW and USFWS. Discovery of the death to a raptor or a threatened or endangered species (regardless of the cause) would be reported to the USFWS and CDW within 24 hours. PSCo would review the case with the CDW and the USFWS to identify the cause of mortality (if possible) and to identify ways to reduce the risk of future impacts.

A summary of the results of the monitoring program completed in 1997 and 1998 may be found in chapters three and four. Monitoring of the project site has continued and control plots have also been established as part of the monitoring program

Phased Development. Data from the avian impact monitoring program would be evaluated in coordination with Federal and state wildlife agencies prior to expansion of the facility once the initial set of turbines has been installed. Unlike large-scale wind development projects constructed elsewhere in the U.S. (Altamont Pass) that incorporate thousands of wind turbines and where avian mortality has been reported, the proposed project would involve a maximum of 27 turbines. Expansion of this project would occur in relatively small stages. This phased approach to development would allow the opportunity to monitor avian impacts and incrementally increase the size of facility if such impacts are found to be minimal. Similarly, data collected as part of the avian monitoring program would suggest the need to maintain or change tower or turbine designs, change turbine locations (e.g., Stage IV locations), implement new impact mitigation measures, or to cap the project size within the project area.

Since the project was first proposed, nearly two-year's worth of baseline and monitoring data has been completed. As of August 1998, only one turbine had been installed on site. Monitoring is continuing as others turbines are being installed in 1998-1999. PSCo and its contractors are still in the process of establishing the advisory group.

The proposed phases in the development of the project have changed since the project was first proposed. Current plans call for the completion of up to 21 turbines by the end of April 1999. The proposed project potential under this EA is evaluated at up to 48 turbines, including those within the proposed expansion area. However, whether more than 21 turbines are installed will depend upon future demand for this "green energy" product.

2.4 No Action Alternative

CEQ regulations implementing NEPA require DOE to consider the No Action Alternative in all NEPA documents. Under the No Action Alternative, DOE would take no action to release funding for the proposed project. DOE adoption of the No Action Alternative could cause construction to be delayed unless the project proponents could quickly develop alternative plans for financing the Ponnequin Wind Project. The No Action Alternative would not meet the purpose and needs described in Section 1.3 of this EA. Under this alternative, even higher premiums for wind-generated electricity could be required which could lead to reduced consumer demand for this electricity. Attempts to develop alternative means for financing the project may

not be successful. For these reasons, this analysis of the No Action Alternative assesses the impacts that would result if failure to fund the project resulted in its abandonment. DOE could choose the No Action Alternative if it offered clear environmental advantages over the Proposed Action or if significant impacts would be created by the Proposed Action which, in turn, would require preparation of an Environmental Impact Statement.

PSCo has proceeded with construction of the project at its own risk. To date no federal funds have been provided to the project. Under the No Action Alternative, PSCo could continue to construct the project at its own risk and without funding or assistance from DOE.

2.5 Alternatives Considered But Not Receiving In-Depth Analysis in this EA

2.5.1 Alternative Locations

Numerous locations have been considered in the past for wind energy sites in Northeast Colorado. PSCo conducted a preliminary review of Northeast Colorado in terms of local wind characteristics, availability of transmission lines, the cost of interconnection, county land use constraints, permitting requirements, potential impacts on birds, the presence of sensitive flora and fauna, and local landowners' willingness to grant long-term easements (Thompson, 1997). Various locations were examined by the CDW for raptor nest structures (see Appendix D). The project area proposed in response to the DOE solicitation and analyzed in this EA incorporates the following features, or a lack of features, which would reduce the risk of environmental impacts.

- The project area and land in the vicinity of the proposed towers are treeless and devoid of shrub cover.
- The only structures taller than the fence posts are the WAPA transmission lines and poles that form the eastern edge of the project area. No raptor nests have been found in these poles.
- The area and adjacent sections are devoid of water features such as ponds, streams, lakes or impoundments which would be attractive to migratory birds or wildlife.
- The project area is devoid of riparian areas and jurisdictional wetlands.
- No streams cross the project area.
- The project area is virtually flat and access roads cross no difficult terrain, water bodies or wetlands.
- The project area is accessible from paved roads using existing ranch roads.
- Vegetation diversity and wildlife habitat suitability in the project area and vicinity are very low.
- The project area and vicinity have been intensively grazed.
- No residences are found in the project area or in close proximity to the project area.
- A survey by the Colorado Division of Wildlife found no raptor nest structures in the project area.
- The project is directly adjacent to power lines that could receive electricity produced by

the facility. No new overhead power lines would be needed.

- Based on existing records, the potential for cultural sites appeared to be low.
- The towers would not be located within a restricted airspace or in close proximity to an airport.

No new factors have been identified since the original EA has been completed which suggest the need for reconsidering alternative sites. The State Board of Land Commissioners recently received a proposal to declare lands adjacent to the project area as Preservation Trust Lands. Unlike past management of State lands which tended to emphasize disposal and revenue, the purpose of the Trust is retain State lands for public purposes. Public access to State lands in the project expansion area has been prohibited by the checkerboard pattern of State-private land holding and the lack of any public right-of-way into those lands. Adjacent private landowners, however, have access to these State lands. The proposed project expansion is not intended to offer or improve public access into these State lands.

Installation of wind turbines in the expansion area would not constitute an irretrievable commitment of resources. Installation and operation of turbines disturbs little surface area. Since the 1997 EA was completed, pronghorn antelope continue to be observed in close proximity to construction sites and turbines. If the wind facility were to be abandoned, towers could be removed and any surface disturbance reclaimed.

Given the estimated, low environmental risks associated with the proposed project area, alternative locations for the proposed facility have not been proposed or analyzed in this document. The Federal action under consideration is whether to fund or not to fund construction at the proposed location.

No new data has been found which would suggest the possibility of increased environmental risks beyond those examined in the original EA and which would justify the need for an alternative site selection process.

2.5.2 Alternative Tower Designs

In general, three options exist for a wind turbine tower: an open lattice tower with horizontal cross-braces, an open lattice tower without horizontal cross-braces but with sharply-angled cross-braces, and a closed tubular tower. The proposed tapered, lattice tower design uses sharply-angled cross-braces (see Figure 2-3). It is a departure from the horizontal cross-braced lattice tower commonly found at the Altamont Pass Wind Resource Area in California. A comparison of alternative tower designs follows.

First, avian mortality at any wind project appears to be caused by collisions with power lines and turbine blades. Visibility of blades would not differ between a lattice and tubular tower configuration. In addition, the potential for mortality would be reduced because all proposed power lines would be buried and the proposed turbine uses a low rpm rotor. Therefore, the only

potential advantage of using a tubular, rather than a lattice tower, is that it may offer fewer opportunities for perch sites for raptors and other birds.

A tubular tower is now the Proposed Action for Phase I. However, it is possible (although unlikely) that during the Phase II stage or beyond a lattice tower design could be utilized.

Second, the attractiveness of the proposed "no-horizontals" lattice design to birds inhabiting the project area and vicinity is unknown. The project area already offers few attractive environmental features for wildlife and avian species. Under these circumstances, while the proposed lattice design may be a more attractive perch site compared to a tubular tower, the actual impact of this "attractiveness" on avian mortality is unknown and cannot be predicted at this time. This is something that would be monitored during project operations (see Appendix B).

This issue is no longer relevant to Phase I as PSCo is now using tubular towers that offer few, if any, perch sites. While possible, it is unlikely that the latice design will be considered in Phase II and beyond.

Third, the project area is characterized by environmental conditions which indicate that it is only marginally attractive to raptors. However, bird use of the project area and changes in the raptor prey base are conditions which would be monitored during project development. The avian impact monitoring program described in Appendix B would collect data on actual, project-related impacts and the risk of avian fatalities. The issue of tubular versus lattice towers and avian impacts would be revisited once monitoring data on the initial phase of the project has been collected.

Data collected over the past year and half since the original EA was completed suggests that the project area and the expansion area continue to be only marginally attractive to raptors.

Fourth, the proposed project is much smaller than wind generation projects elsewhere in the country where avian mortalities have been a concern. For example, the Altamont Pass Wind Resource Area in California contains 6,500 turbines of various designs. Some perching on tubular towers has been observed in that area.

The factors described in this item have not changed as a result of the expanded project.

Fifth, concerns about the potential advantage of tubular towers must be weighed against their disadvantages. Tubular towers require more extensive and costly concrete foundations. The energy and financial costs of manufacturing and installing a tubular tower are also higher than a lattice tower.

The factors described in this item have not changed as a result of the expanded EA.

For the reasons discussed above, it appears that tubular towers offer no clear, demonstrated

environmental advantages for the initial stage of this project. At the same time, the disadvantages of using tubular towers could compromise the feasibility of this first commercialization venture and the achievement of other environmental benefits. Therefore, this alternative has not been analyzed further in this document. Similarly, a lattice tower with horizontal cross-braces offers a higher potential for avian impacts; therefore, it has not be analyzed further in this EA.

While the avian and monitoring surveys conducted to date suggest no compelling environmental advantages for adopting the tubular tower, its adoption in Phase I does eliminate another source of risk, uncertainty and public concern associated with the project.

2.5.3 Alternative Access Routes

The access route from Highway 85 (see Figure 2-1) would be the preferred route to access the project for several reasons. It is the shortest route to a paved road. This route would require the least amount of road upgrading or maintenance during facility construction and operations. The route crosses state land (Section 20, see Figure 2-1) and requires the use of only a short segment of existing road across private land (Section 21). However, the private landowners have denied PSCo access, effectively denying access to the State land and the adjacent project area. PSCo was required to pursue an alternative route and has proposed the access route from State Highway 223. For these reasons, the preferred route is not analyzed further in this document.

This situation has not changed and PSCo has now completed improvements to the proposed access road from State Highway 223. For this reason, no alternative access routes are considered.

CHAPTER THREE
AFFECTED ENVIRONMENT

3.1 Resources Considered But Not Receiving Further Analysis

The potentially affected environment considered in this chapter includes the physical, biological, and human environment (40 CFR 1508.14). However, the purpose of this chapter is not to provide an encyclopedic description of the project area but rather to present a brief description of the proposed project area and the surrounding environment. Detailed information on environmental conditions is only presented where it would assist the understanding, interpretation, assessment and disclosure of potential impacts associated with the project. This information was derived from printed sources, technical reports, on-site inspections and conversations with experts on a variety of subjects. To help the reader visualize the project area and environs, photographs have been included as Figure 3-1.

Potentially affected resources requiring further analysis were identified during internal DOE scoping, public scoping and on-site inspection of the project area. The following resources are either not found in the project area or vicinity, or would not be affected, either directly or indirectly, by the proposed action or project alternatives; therefore, they are not analyzed further in this document:

- National parks, recreation areas or monuments;
- Prime or unique farmlands;
- National historic sites;
- Wilderness or wilderness study areas;
- Areas of critical environmental concern;
- National historic, scenic or recreation trails;
- Wild, scenic and recreational rivers;
- Recreation sites, facilities, areas;
- Lands administered by agencies of the Federal government;
- National wildlife refuges;
- State parks or conservation lands or state-designated wildlife protection areas;
- Tribal lands;
- Fisheries;
- Timber, forest lands; and,
- Groundwater aquifers.

Figure 3-1, Photographs of the Project Area

NOT AVAILABLE ELECTRONICALLY

Figure 3-1 continued, Photographs of the Project Area

NOT AVAILABLE ELECTRONICALLY

None of the resources listed above would be affected by the project expansion. The project expansion area encompasses portions of three sections of State land administered by the Colorado Board of Land Commissioners. These sections have been nominated for inclusion in the Stewardship Trust administered by the Board. A final decision on the nomination of lands within the project expansion area is not expected until late 1998 or 1999. Nonetheless, any land placed in the Trust will continue to be managed for the benefit of public education; however, parcels in the Trust cannot be sold or exchanged without first being removed from the Trust by a vote of the Board.

3.2 Streams, Wetlands and Floodplains

Field reconnaissance found no perennial streams (i.e. streams that flow year-round) within the project area, on adjacent sections of land, or crossed by the proposed access road (Reeve, 1997; Jacob, 1997). Intermittent streams are found in draws on the south and southeast edge of the project area (see Figure 2-1). These streams are tributary to Owl Creek--itself an intermittent stream. Draws in the vicinity of the existing access road can also carry water during storm events and spring runoff. Localized flooding from these channels could occur during intense thunderstorms. Some water collects in draws at the south edge of the project area and in draws in the vicinity of the access road during the spring snow melt or storm events, but this water is consumed by grazing cattle and the remainder quickly evaporates.

A review of National Wetland Inventory maps found no wetlands within the project area and no wetlands crossed by the existing or proposed access roads. One small wetland (less than 0.5 acre) is found in the vicinity of a 0.1 mile section of proposed, new access road in the far northwest corner of Section 13 (see Figure 2-1). This wetland is classified as "palustrine, emergent, temporarily or seasonally flooded" on the National Wetland Inventory map. PSCo would avoid this wetland as part of its Proposed Action. No willows, cottonwoods or similar types of riparian vegetation are associated with this wetland.

Riparian vegetation (e.g., willows, cottonwood) is generally absent from draws along the existing access road. National Wetland Inventory maps do not show any wetland-riparian areas associated with these draws. No water was observed flowing in these draws during field reconnaissance conducted for this EA. Vegetation of the project area and vicinity is heavily grazed. No trees or wetland or riparian vegetation were observed during field reconnaissances of the project area (Jacob, 1997; Reeve, 1997). The one soil type found within the project area is classified as “non-hydric”; that is, it is not a soil associated with wetlands (SCS, 1993).

The project expansion area only encompasses the mesa top and does not include lands below the mesa rim such as draws, streams or valley bottoms. No wetlands, floodplains, riparian areas or streams are found within the project expansion area.

3.3 Surface Water Quality

No data on surface water quality exists for intermittent streams in sections adjacent to the project area. The closest water quality monitoring station is on Lone Creek at Carr, Colorado, approximately eight miles southwest of the project area. Average daily discharge at this location almost never exceeds one cubic foot per second whatever the season (USGS, 1995). No ponds or other surface water bodies are found in the project area. Some springs are found at the base of mesas or within draws outside the project area. No springs have been identified within the project area. A windmill that pumps water from a well more than 100 feet deep is used to supply water for stock tanks found near some outbuildings within the project area (see Figure 2-2).

The project expansion area is outside of these drainages. No activities have been proposed which would involve construction within, across or adjacent to stream channels, wetlands, ponds, lakes or springs.

3.4 Soils and Vegetation

The project area is unirrigated range land which is currently used for cattle grazing and as a winter feeding area from about November through May. Lands along access roads into the project area are used for cattle grazing and a commercial buffalo raising operation. Vegetation of the project area is similar to that observed along access roads. Grazing pressure has resulted in a uniform, closely cropped pasture. The current owners have grazed the project area for 35 years. In that time it has not been plowed or seeded.

According to the soil survey, the project area is uniformly characterized by a soil known as Bresser sandy loam (SCS, 1982). This non-hydric, deep, well-drained soil is found on nearly level (0-3 percent slope) high plains and was formed of sandy alluvium. Typically, the topsoil is a coarse, sandy loam up to 15 inches thick; the subsoil is a sand-clay loam 22 inches thick; and the substratum is loamy coarse sand to a depth of 60 inches or more. In some areas, this loamy-coarse sand appears on the surface.

Permeability of this soil is moderate. Available water capacity is also moderate. Effective rooting depth is 60 inches or more. Runoff is slow to medium and the potential for soil erosion by water is slight. The hazard of blowing soils is moderate but is likely to increase if vegetation holding topsoil in place is disturbed. Precipitation is too low for planted grasses or grains to utilize fertilizers effectively. To help control erosion and conserve moisture, only minimum tillage is recommended. Where necessary, terraces can be used to intercept runoff and reduce soil erosion.

Precipitation in the project area averages about 13 inches a year and is likely to be greatest in the late spring and early summer. Accumulations of snow may occur during the winter months which melt to provide moisture for seed germination in the spring. Under these conditions, the plant community is a grassland comprised of blue grama, needle-and-thread, prairie sandreed, fringed sage, birdfoot sagewort, scarlet globemallow, prickly pear, buffalo grass, wheat grasses and yucca (SCS, 1982). However, this vegetation has been altered by intensive grazing which tends to increase the proportion of less desirable plant species (e.g., prickly pear). If the plant cover is

disturbed, protection from erosion is needed. Loss of topsoil can result in a severe decrease in productivity and make subsequent stabilization difficult. The potential for noxious weed invasions exists, particularly where soils have been disturbed by construction activities. This soil is suited to planting of windbreaks but supplemental irrigation would be needed. No trees or shrubs are found in the project area. Affected soils are generally suited for a variety of grain crops such as winter wheat and barley but these crops are not grown in the project area.

None of the soils potentially crossed by access roads are listed as hydric (typically wetland-associated). Characteristics are generally similar to those of the project area. Soil limitations (e.g., susceptibility to wind erosion and noxious weed invasion, low precipitation) are also similar.

The project expansion area is contiguous with the project area analyzed in the August 1997 EA. This description of soil and vegetation is applicable to the project expansion area as well. Trenching for a buried power line to the first turbine encountered no problems with rock or shallow bedrock. Construction of tower foundations confirmed that soils were deep (greater than 3-4 feet) sandy loam. Foundations for turbine towers could be excavated with a front-loader. Successful revegetation of disturbed areas was achieved in one growing season.

3.5 Meteorology and Air Quality

3.5.1 Meteorology

According to a wind atlas of the area (DeHapporte, 1984), the project area is characterized by Class 4 or 5 winds. Areas designated Class 4 or greater are considered suitable for wind energy development using a variety of tower configurations. However, this general classification system does not address significant local variability in wind speeds. Because the project area is a relatively flat mesa approximately 6,300 feet in elevation, it is exposed to southerly, westerly and northerly winds.

A 140-foot meteorological tower was built within the project area in September 1996 to collect additional, site-specific data on wind conditions. Location of the tower is shown in Figure 2-2. Wind data is being collected at three levels: 32 feet, 82 feet and 140 feet. The average wind speed at the top of the tower has been estimated at 16.3 miles per hour. Preliminary data from the tower indicate that wind patterns are highly correlated with those reported at the Cheyenne, Wyoming airport approximately 10 miles north. Average annual wind speed in Cheyenne is 13 miles per hour near ground level and an estimated 16.6 miles per hour at 130 feet. Peak gusts recorded at the Cheyenne airport range from 58 to 77 miles per hour depending upon the time of year.

Additional meteorological data has been gathered since the August 1997 EA was completed and a second meteorological tower has been installed. Data has also been gathered from the operation of a single turbine installed on the site earlier in 1998. This data has been used to refine the project design and the project expansion—specifically the number, placement,

dimensions and expected output of the turbines.

3.5.2 Air Quality

The project area is outside any non-attainment area for criteria air pollutants and any listed Class I Area (40 CFR 81.400). Class I refers to a set of the most stringent federal air quality standards which are intended to prevent the significant deterioration of air quality in national parks and wilderness areas. The closest Class I areas are Rocky Mountain National Park, approximately 50 air miles to the southwest, and the Rawah Wilderness Area, approximately 60 air miles to the west. However, it is expected that many consumers likely to purchase electricity from the project live in Front Range communities which include non-attainment areas for ozone, particulates and carbon monoxide.

The majority of commitments to purchase electricity from the project have come from Front Range Colorado businesses and residences.

3.6 Socioeconomic Conditions

The project area is located in Weld County, Colorado which has an estimated population of 143,800. Approximately 45 percent of its residents reside in the city of Greeley, 30 percent live in other towns and the remainder of its residents live in unincorporated areas. Cheyenne, Wyoming is the closest major city or town to the project area. The project area is outside of any incorporated city or town. The closest home is 1.5 miles from the project area.

With the project expansion area, the closest residence is approximately one mile from the expanded project.

An estimated 72 percent of County residents are white, 21 percent are Hispanic and 2 percent from other racial-ethnic groups. Unemployment rate in 1996 was 4.4 percent and in recent years has tended to be very close to the state average. Of persons 25 years or older, 75 percent have a high-school education and 18 percent have a bachelor's degree or higher. Average household income in Weld County in 1994 was $37,324. Weld County is one of the key growth areas of Northern Colorado. Since 1990, population has been increasing an average of 2-3 percent per year. While a large part of the County is agricultural, farming and agribusiness account for only 14 percent of the County labor force. Manufacturing, technology and the service sector have become very important employers in the County.

The project area is located in an agricultural area. No industrial or manufacturing facilities are found in the vicinity. No economically disadvantaged communities are found near the proposed project area. Because of the short construction time involved (90 days), the project is unlikely to cause the permanent relocation of out-of-state personnel to Colorado. In addition, PSCo intends to use local contractors and existing PSCo employees wherever feasible. No new permanent hires are expected. For these reasons, the project is not expected to affect local incomes, employment

or population, or the demand for housing, government services, educational or health services. Therefore, these conditions are not examined further in this document.

The above description is applicable to the project expansion area. While the project construction phase of the expanded project would extend much longer than 90 days, the actual, in-field time required to install a wind turbine is less than 90 days. For example, with the Micon turbine, construction of a foundation takes approximately 5 days. Concrete must then cure for 14-30 days. Once the foundation and auxiliary work (e.g., power line trenching) has been completed, installation and connection of a single wind turbine can be completed in about 2-3 days. Because a heavy crane is used in the erection of the tower and placement of the rotor and blades, it is more economical to construct a series of towers at one time. Once a crane is on site, approximately 7 wind turbines can be erected in a week.

The project area is currently used for grazing cattle. According to the Weld County Assessor's Office, property tax revenue from the project area is $113.46 per year. Property taxes would apply to proposed improvements made to the property and would increase revenues to Weld County. Colorado levies a five percent sales-use tax on applicable purchases which would result in increased state revenues. Increased tax revenue from property improvements is usually considered a positive socio-economic impact.

The project expansion area is State land that has been leased to private businesses for grazing purposes. For the same lands, the State Board of Land Commissioners has reserved the following rights:

> *"The right to lease all or any portion of the premises to other persons for the purposes of exploring for and removing timber, minerals, ores, metals, coal, asphaltum, oil, gas, sand…and all other naturally occurring resources together with reasonable and adequate rights of entry and surface rights necessary or convenient to exercise such reserved rights…The right to put the Premises to additional uses by granting additional leases, permits, access, or rights to the Premises or any portion thereof, at any time and for any purpose including but not limited to hunting, fishing and other recreational purposes."*

3.7 Energy Resources

Currently, there is no commercial-scale wind energy facility in Colorado. Electricity demand in the state is met by coal or natural gas-fired generating stations. Currently consumers are not offered the opportunity to purchase electricity generated by a renewable energy source. There are no oil or gas wells in the project area. No other energy facilities are found in the project area. Two sets of WAPA power lines (230-kv, 115-kv) follow the eastern boundary of the project area.

Since the issuance of the August 1997 EA (DOE/EA-1221) renewable wind energy resource generating facilities have been constructed at the Ponnequin site in Colorado. Colorado residents are currently being offered the opportunity to purchase wind-generated electricity

through the PSCo WindSource program. The subject WAPA power lines would bisect the expanded project area, following the boundary between Sections 19 and 20 (see Figure 2-1).

3.8 Noise

Baseline noise studies have not been conducted at the Weld County site. Based on studies conducted in rural situations in southern Wyoming (BLM, 1995) with similar wind, topography, vegetation and land use patterns, it is estimated that background noise levels in the project area vary between 30 decibels on average (dB(A)) and 45 dB(A). Background noise levels in the project area are affected by wind and aircraft noise from the Francis Warren Air Force Base on the east side of Cheyenne, Wyoming and the Cheyenne airport. No noise sensitive areas, such as occupied residences, are found within 1.5 miles of the project area. No potentially noise sensitive areas, such as raptor nest structures, were found during a survey of the project area. No Federal, state or local noise standards applicable to a wind project are known to apply to the project area.

With the addition of the project expansion area, the closest occupied residence would be approximately one mile away. Local topography and its proximity to U.S. Highway 85 would also affect background noise levels at this residence.

3.9 Transportation

Three major highways can be used to reach the project area: Interstate 25, U.S. Highway 85 and State Highway 223. All of these highways can handle the proposed level of heavy truck traffic and can accommodate the transport of construction and turbine equipment. Numerous local roads crisscross the project area and vicinity. Many of these roads are not shown on topographic maps (see Figure 2-1) but are evident in the field and on aerial photography supplied by Weld County. Use of roads across private property to reach the project area requires the permission of the landowner. Road construction across state or private land requires the approval of the affected landowner. In general, local private roads are intended for cattle operations and portions of them would not be suitable for heavy truck traffic without some improvements such as gravel and/or blading the road surface.

The owners of the Terry Bison Ranch granted PSCo the right to cross their lands to access the project site from State Highway 223 (recorded with the Laramie (WY) County Clerk, Book 1490, pp. 0455-0472, July 30, 1998). That highway connects Interstate 25 and U.S. Highway 85 (see Figure 2-1). No new access will be needed for activities within the project expansion area.

3.10 Cultural Resources

According to regulations promulgated under the National Historic Preservation Act (36 CFR 800.1(a)), a Federal agency having direct or indirect jurisdiction over a Federally-assisted undertaking is required--prior to the expenditure of any Federal funds for the undertaking--to "take into account" the effect of the undertaking on any district, site, building, structure, or object

that is included or eligible for inclusion in the National Register of Historic Places. That the undertaking would occur on private land does not affect the applicability of this requirement. The agency is still required to make a reasonable and good faith effort to take into account the effects of the proposed activity on eligible and listed properties.

That the project would occur on private and State lands, or on State grazing leases held by private interests, does not affect the applicability of this requirement. The DOE is still required to make a reasonable and good faith effort to take into account the effects of the project activities on eligible and listed properties on the National Register of Historic Places. Further, the State Antiquities Act of 1973 claims State ownership of all cultural resources on all State lands.

The project area is on top and at the edge of a large mesa in generally level to rolling grasslands. At its southernmost extent, the project area encounters breaks along the mesa edge, where erosional activity and subsequent down cutting have created steep-sided gullies. These gullies intermittently carry water southeastward for about four miles to Owl Creek, an intermittent tributary of the South Platte River, which is about 40 miles to the south. The nearest permanent drainages are several miles east and west of the project area. It is possible that any of the following prehistoric stages and their associated temporal sequences may be represented in this area: the Paleo-Indian (11,500-5,500 B.C.), Archaic (5,500 B.C.-A.D. 1), Ceramic (A.D. 1-1,550) and Protohistoric/Historic (A.D. 1,550-1,800) (Eighmy, 1984). Many historical themes discussed in Mehls (1984) have application to the project area. Those with the greatest relevance to the project area include Early Exploration (1841-1856), The Fur Trade (1800-1870), Territory and Conflict (1858-1876), Trails, Rails, and Transportation (1859-1940), and Ranching and Farming Before and After 1900.

The project expansion area does not include gullies found below the mesa rim.

Considering data from the files search and information found in Eighmy (1984), little is known about site density in the project area. Studies conducted further east in Weld County on the Pawnee National Grassland show that prehistoric site density averages about one site per 40 acres. A compilation of site data from the Colorado Historical Society, Office of Archaeology and Historic Preservation (OAPH) shows that surveys have been conducted on two percent of Weld County (approximately 51,072 acres) and that 1,220 known prehistoric sites have been found. Extrapolating from that small sample, an average site density is estimated to be one site per 42 acres. Unfortunately, the selection of survey parcels is not random and it is likely that areas of the County will have higher or lower site densities. Further, based on the OAPH data, the most likely prehistoric site types statewide are open lithic scatters and open camps; however, a file search conducted at the Colorado Historical Society of a 144 square mile area centered on the project area found that stone circles account for the largest number of known sites. Nevertheless, given the project's distance from permanent water, it was anticipated that site density would be low and that sites would likely be single activity lithic procurement and/or reduction locales, rather than multi-activity, open campsites or stone circle sites.

It was anticipated that historical site density also would be low. Based on the area's traditional agricultural use, it was anticipated that any historical sites would probably postdate the early 1900's and be related to ranching activities. Such manifestations would likely be roads, trash dumps, sheds, fences, foundations or other ranch building-related features, or pieces of machinery.

The search of the records of the State Office of Archaeology and Historic Preservation conducted in 1997 encompassed an area that included the original project area as well as the project expansion area addressed in this EA. A second records search was conducted in September 1998 on the adjacent lands reveling no new additional resources or sites discovered since the 1997 search (see Section 4.10 for field search results). Based on the results of these searches and past field work, it was expected that, due to the project expansion area's distance from permanent water, prehistoric site density would be relatively low.

An intensive pedestrian cultural resources survey of the entire project area was conducted in May 1997 and a report submitted to DOE and the SHPO (Tate, 1997). This survey of the project area found only the following cultural resources--all classified as "isolated finds":

- A prehistoric artifact that was a cobble of pinkish quartzite, with five flakes removed;
- An abandoned Ford truck of 1952 vintage which has a gross vehicle weight of 21,000 pounds and was last licensed in Wyoming in 1978; and,
- The remnants of an old two-track road long-abandoned and now completely overgrown with vegetation.

The results of the survey of the original project area (Section 19 of Township 12 North, Range 66 West) are on file with DOE and the SHPO.

According to the project area's current landowners, the abandoned road apparently crossed the project parcel several decades ago when it served to connect surrounding parcels of land on the old Warren ranch. These parcels are presently owned by the Terry Bison Ranch and the Lazy D Grazing Association. While the Warren Livestock Company is associated with a regionally prominent person, Francis E. Warren, who is known for his role in Wyoming politics, the road has minimal integrity and low research value. For these reasons the road was recorded as an isolated find. More detailed information on these topics may be found in the cultural report prepared for this project (Tate, 1997) which is on file with DOE and SHPO.

It should also be noted that some of these parcels are State land. An intensive pedestrian cultural resources survey of the project expansion area was conducted in September 1998 and a report has been submitted to DOE and SHPO (Harrison and Tate, 1998). The following cultural resources—prehistoric and isolated finds—were discovered on State lands as a result of the survey:

- *Two open lithic sites with stone cairn features;*

- *Three stone circle sites; and*
- *20 isolated artifacts or stone cairns.*

3.11 Visual Resources

Vistas in the project area and vicinity include at least two major transmission lines, a railroad, highways, commercial developments, windmills, radio and communication towers, and ranch buildings. No visually sensitive areas such as natural areas, parks, scenic overlooks or undisturbed vistas are found near the project area.

A field examination was conducted in August 1998 of the one wind turbine tower that had been constructed (Jacob, 1998). The examination was conducted by two persons familiar with the location of the tower. The tower was visible from some points along Interstate 25, Interstate 80, Highway 223, U.S. Highway 85, and from various points within Cheyenne, WY. Typically, however, the height of the turbine tower appeared approximately equivalent to other visual intrusions such as transmission line towers. Visibility was dependent upon local topography and in many instances the tower was visible for only a few seconds to a casual observer in a car travelling these roads.

3.12 Land Use

Weld County has classified this project as a major facility of a public utility. Construction of the project is dependent upon receiving a Land Use Permit (specifically, a Use by Special Review Permit) from the County. The purpose of this permit process is to ensure compatibility of the project with existing and proposed land uses as well as County regulations intended to protect environmentally sensitive areas. The permit for the project was approved by Weld County in June 1997.

PSCo has continued to work with Weld County regarding any necessary modifications in the permit to construct the expanded project.

3.13 Public Health and Safety

The natural hazard most likely in the project area would be high winds and tornadoes. Wind turbines and electrical equipment would present the risk of electrocution, fall or aircraft collisions. The FAA requires written notification before construction of any structure 200 feet or greater. The FAA then determines whether the structure is a threat to aviation and what warning lights or markings would be required to enhance the structure's visibility. Discussion of potential health risks associated with high-voltage power lines would not be germane to this EA as no such lines have been proposed and no houses are found within at least 1.5 miles of the proposed substation. Roads into the project area are gated and generally not open to members of the public who might otherwise approach the turbine towers.

The existing access road into the project area is gated and locked when construction is not occurring. The existing turbine tower has been equipped with a flashing beacon in conformance with FAA requirements. No ladders are found on the outside of the turbine towers. The towers are equipped with a heavy metal door that locks and prevents unauthorized access to the control panel and ladder contained within the base of the tower.

3.14 Wildlife

The description that follows is applicable to the original project area as well as the project expansion area. Despite a relatively wet season, the wildlife biologist conducting field surveys in 1997-1998 found no substantial change in wildlife conditions that would substantially alter the applicability of the description that follows (Ryder, 1998).

As many as 108 species of vertebrate wildlife potentially occur in the project area and vicinity (Appendix C). However, the small size of the project site, its heavily grazed vegetation, lack of topographic and vegetative variation, and limited availability of water and cover limit potential wildlife diversity. Few species are expected to be found in great numbers on the project area.

Information used in this section was obtained from published literature including government documents, unpublished wildlife agency reports and unpublished data, theses and dissertations; several site visits (including an aerial raptor nesting survey); and information received from the Wyoming Natural Diversity Database and the Colorado Natural Heritage Program.

Mule Deer and Pronghorn. Pronghorn and mule deer are the principal big game species found in the vicinity of the project area. White-tailed deer may occasionally be present, although they are probably restricted to riparian vegetation associated with Owl Creek and Lone Tree Creek (4-6 miles south of the project area). Pronghorn are the most abundant big game species in this area. Because they move across the Colorado-Wyoming border, they are managed by both the Wyoming Game and Fish Department (WGFD) and CDW. Because of the interstate nature of the population and the large amount of private land in the area, estimating population with any confidence has been difficult. Even so, WGFD considers the pronghorn herd to be over the population objective (more than 450 animals) in Wyoming (Olson, 1995a). Pronghorn in this area seem to have experienced a drop in buck:doe ratios since 1991 although doe:fawn ratios have remained consistent.

In 1985, CDW initiated a two-year trapping and marking study to assess pronghorn movements across the Wyoming-Colorado border (CDW, 1986). Results of the study showed that pronghorn do move back and forth between Colorado and Wyoming although no definitive migration patterns were observed. Movements appear to be driven by the seasonal availability of forage. Studies conducted elsewhere have emphasized the importance of sagebrush to wintering pronghorn (Martinka, 1967; Severson et al., 1968; Bayless, 1969; Clary and Beale, 1983; Alldredge and Deblinger, 1988). Wintering pronghorn on Great Plains grasslands, however, have few shrubs available and may depend on cultivated winter wheat to sustain them (Sexton et al.,

1981; Cook and Irwin, 1985). Pronghorn depredations on winter wheat have been a problem south of the project area near Nunn, Colorado (Wagner, 1997).

Fences can be physical barriers to pronghorn movements. The western edge of the project area borders the Terry Bison Ranch. There, a multi-strand, smooth, high-tensile wire, "New Zealand" fence is used to retain bison. Similar non-electric 15-strand high-tensile wire fences have been used successfully in Colorado to restrict big game and livestock from livestock feed and forage (Byrne, 1989). Pronghorn or mule deer are not expected to enter the project area from the west. However, the remainder of the site is fenced with 4-5 strand barbed wire. Unlike mule deer, pronghorn seldom jump fences and usually go under them at points having greatest ground clearance between to the bottom wire (Prenzlow, 1965; Anderson and Denton, 1980). The existing barbed-wire fence is not expected to be much of a barrier to pronghorn movement across the project site. Data from the CDW's pronghorn study (CDW, 1986) show that very few animals moved across the project area during north-south seasonal movements. Whether this is a real pattern, perhaps related to steeper topography on the south side of the project area, fences surrounding the project area, or an artifact of limited sample sizes could not be determined from the data.

Mule deer in this area are also part of an interstate herd that frequently moves across the Colorado-Wyoming border. Mule deer will use a variety of habitats in this region including short-grass prairie, riparian systems with irrigated crops, farmstead shelter belts, and extensive areas of winter wheat. Preferred habitat, however, will be shrub lands on rough, broken terrain, which provide abundant browse and cover (Fitzgerald et al., 1994). Because these habitats are limited in the region, deer are found scattered over large areas in relatively low densities. Due to a variety of factors, this herd appears to be experiencing a population decline which has also been seen in other regions of Wyoming (Olson, 1995b).

Other Mammals. Based on records from the Wyoming Natural Heritage Database, field observations, species ranges and habitat associations (Clark and Stromberg, 1987; Fitzgerald et al., 1994; Reeve, 1997), 34 mammal species are known to occur or may occur within the project area during at least a part of the year (Appendix C).

Carnivores occurring in the area include coyote, swift fox, badger, long-tailed weasel, and stripped skunk. Two coyotes were observed on the site during a field visit in May 1997 possibly attracted to a cow carcass (Reeve, 1997). What may be a coyote den was also found in a drainage south of the mesa. Because they can be significant predators of swift fox (Covell and Rongstad, 1990), the presence of coyotes in and around the wind energy project area may regulate swift fox numbers in the area.

As many as 16 rodent species could occur in the vicinity of the project area. Rodents are of particular interest because they are prey to resident and migrating raptors. A small canyon with an intermittent drainage on the south edge of the project area provides more habitat and topographic diversity relative to the rest of the project area. Small mammals are expected to be

more abundant and diverse there. Although apparently not abundant, Wyoming ground squirrels were observed in the project area during May 1997. Mounds and tunnel casts of northern pocket gophers were also found within the project area. Although black-tailed prairie dogs might be expected in the area, none were observed during either ground or aerial surveys.

Prairie dogs were probably once common in the area but their numbers have been extensively controlled because of their negative impact on agriculture. Continued pressure from the livestock industry will likely continue to keep population numbers low (Fitzgerald et al., 1994) which would limit the potential for them to expand into the project area.

Desert cottontail, black-tailed jackrabbit, and white-tailed jackrabbit potentially occur in the project area or vicinity. Although these species are well adapted to open grasslands, they all require adequate hiding cover such as prairie dog burrows, scattered trees or shrubs, or crevices and spaces under rocks. Lagomorphs (e.g., various species of rabbits, hares) in the project area are most likely to be found in the drainage at the south edge of the project area where yucca and serviceberry are common.

Six species of bats potentially occur in the vicinity of the project area. These species roost in trees, rock crevices, caves, mines, and buildings. Although outbuildings are found within the project area, none of the other features are present. Because the distribution and abundance of North American bats are determined largely by the availability of suitable roost sites (Humphrey, 1975), it seems unlikely that bats are abundant at the site. Tree roosting species such as the hoary and silver-haired bat may pass through the area only during spring and fall migrations.

Field studies conducted in 1997-1998 found a general lack of a prey base within the original project area as well as on surrounding lands (Ryder, 1998). During field studies conducted for six months in the winter, spring and summer of 1998, only two mammalian species known to be prey for raptors were observed—thirteen-lined ground squirrel and pocket gopher. Fewer than five rabbits or hares were observed in the project area and vicinity during this time. No change was found in these conditions between 1997 and 1998 despite weather that was more favorable to the production of food sources exploited by rodents. No noticeable change in rodent burrowing activity or prey base was found to occur in 1998 as a result of construction, excavation or trenching activities.

Raptors. Raptors refers to hawks, eagles, owls and related species. Before PSCo proposed a project area, CDW was consulted about the potential for avian conflicts and past observations of raptor nesting activities at several potential sites. The agency's raptor biologist surveyed five potential sites and adjacent lands from the air. In his opinion, the proposed project area had a low potential for conflicts with raptor species such as golden eagles (Appendix D). The project area was found to contain little suitable habitat (nesting substrates) for nesting raptors except for ground-nesting species. No trees or shrubs are present and grass-covered or cobble slopes characterize the sides of mesas in the project area and vicinity. There is no evidence that transmission line towers found on the east edge of the project area have been used for nesting

although birds might perch on suitable horizontal structures.

In addition to protection provided by the Migratory Bird Treaty Act and the Endangered Species Act (discussed in more detail below), Federal regulations (50 CFR 22) implementing the Eagle Protection Act protect bald and golden eagles such that no person shall take, possess, or transport any bald eagle or golden eagle except as allowed under a valid permit (50 CFR 22.12). Permits may be issued for scientific or exhibition purposes, Native American religious use, depredation control, falconry purposes or for an authorized take of a golden eagle nest. These permit regulations do not explicitly address a "take" or and "incidental take" of a bald or golden eagle due to collisions with aircraft, vehicles, towers, buildings, wind turbines or other structures.

To assess the risk of raptor collisions with the proposed wind turbines, raptor nesting surveys were conducted during spring 1997 within a 169-square mile survey area defined as a 13-mile by 13-mile square centered on the existing meteorological tower (see Figure 2-2). The decision to survey a 169-square mile area for raptor nests was based on two reasons: 1) breeding territories of golden eagles are usually about 4.4 miles; and, 2) golden eagles forage farther from their nest sites than any other raptors likely to nest within the survey area--with the exceptions of northern harriers and prairie falcons (Kochert, 1986). Nesting densities of golden eagles in the western U.S. range from one nest per 19 square miles to one nest per 55 square miles with an average distance between nests of 2.5 miles to 4.4 miles, respectively (Phillips and Beske, 1982; Johnsgard, 1990). Based on a study of 140 nest sites in northeast Wyoming, the distance between nearest-occupied golden eagle nests averaged 2.7 miles and ranged from 1.0 to 7.0 miles (Phillips and Beske, 1984). Surveying at least 6.5 miles from the meteorological tower was judged adequate to determine whether nesting golden eagles occurred within an area that could include the project area as part of a nesting territory. Once in the field, actual survey observations were made up to 9.2 miles from the center of the project area (Reeve, 1997).

At least seven raptor species were found to nest within the 169-square mile survey area. These included golden eagle, ferruginous hawk, Swainson's hawk, red-tailed hawk, prairie falcon, American kestrel, and great-horned owl. Nest sites for each of these species were found during aerial and/or ground surveys conducted in April and May 1997 (Reeve, 1997). Other species, including northern harrier, barn owl, and burrowing owl may also nest within the area surveyed (Olendorff, 1973; Ryder, 1997).

No nests were found within the project area. The closest nest to the project area was an unoccupied nest structure found approximately 0.7 miles from the meteorological tower. That nest site had been used by golden eagles in 1971 (Olendorff, 1973) but no information on its recent history could be found.

A total of 27 active and inactive nest sites were found during 1997 surveys of the 169 square mile survey area. These included five golden eagle nests--four of which were occupied by adult birds. The fifth nest was inactive but had been active in 1996 (Ryder, 1997). One additional active golden eagle nest was seen outside the survey area about 8.5 miles from the meteorological

tower. This nest was reported active in 1971 (Olendorff, 1973) but no more recent data is available. Within the survey area, two of the golden eagle nests were in trees and the other three were on cliffs. Distances of golden eagle nests to the meteorological tower ranged from 4.8 to 7.4 miles. If these same nest sites were occupied in the future, it is likely that the project area could be used by at least two nesting pairs of golden eagles for foraging during the nesting period (February through August) and by post-fledgling juveniles (late June through August).

Four ferruginous hawk nest sites within the nesting survey area were found occupied during the April-May surveys. Three additional ferruginous hawk nest structures were found unoccupied--one of which was active in 1970 and 1971 (Olendorff 1973). The closest ferruginous hawk nest was 4.0 miles from the meteorological tower. Since ferruginous hawks typically forage within 2 miles of their nests (Kochert, 1986) they are not expected to use the project area for foraging during the nesting period.

A potential nesting cavity in a cliff 4.2 miles from the project area was occupied by prairie falcons. Prairie falcons may hunt up to 15 miles from nests (Kochert, 1986) for prey which includes mostly ground squirrels but also horned larks, mourning doves, and common nighthawks (MacLaren, 1986). These prey items could occur on the project area.

Nests of Swainson's hawks, red-tailed hawks and great-horned owls were all found in trees within the 169 square-mile survey area. Of these species, the closest nest to the project area was a red-tailed hawk nest found 2.6 miles from the meteorological tower. These species typically forage within 2 miles of their nests (Kochert, 1986); however, a nesting pair and juveniles might search for prey as far as the project area. The nest site in a tree 0.7-mile from the meteorological tower used by golden eagles in early 1970's could be suitable for use by Swainson’s or red-tailed hawks or great-horned owls. A pair of Swainson's hawks was observed at that site during the May 1997 survey but whether it was used for nesting could not be determined. The nest site is on private land on which public access is prohibited.

Many nest boxes designed for use by American kestrels have been installed on the Terry Bison Ranch near the project area and the City of Fort Collins Meadow Springs Ranch found west of Interstate 25 (Ryder, 1997). The closest box is approximately two miles from the meteorological tower. Also, artificial nesting platforms have been placed in trees along riparian zones south and west of the project area. These have been used for nesting by Swainson's hawks, red-tailed hawks and great-horned owls (Ryder, 1997). None of these structures is closer than 5.6 miles from the meteorological tower. Raptors species that might nest in those structures are not expected to forage within the project area.

Available data (Olendorff, 1973) shows that overall nesting density within the raptor survey area is greater now than it was in the early 1970's. Compared to the 1970-1971 nesting seasons, more golden eagles, ferruginous hawks, red-tailed hawks, Swainson's hawks and great-horned owls are nesting within the area. Elsewhere in northeastern Colorado, nesting ferruginous hawk populations declined between 1972 and 1990 while nesting populations of Swainson's hawks, red-

tailed hawks, prairie falcons and great-horned owls increased during that time (Leslie, 1992). Decreased nesting success by ferruginous hawks may have been due to human disturbances but also increased nesting by other hawk species and great-horned owls (Leslie, 1992). Between 1993 and 1995, nesting activities of raptors on the Pawnee National Grasslands fluctuated from year-to-year due, in part, to cold, wet weather during April and May (M. Ball, 1996, unpublished data).

Besides species found nesting in the survey area, others are likely to winter or migrate through the survey area during fall and spring. Raptors that may winter in the vicinity of the project area include golden eagles, northern harriers, prairie falcons, ferruginous hawks, red-tailed hawks and rough-legged hawks (Marion, 1970). Fall migrations of American kestrels, northern harriers and Swainson's hawks peak from late August through mid-September while spring migrations of northern harriers begin by early March (Craig, 1970). Swainson's hawks are not likely to appear in the area until late April (Craig, 1970). Swainson's hawks captured and banded in northeast Colorado have been recovered in Argentina and Columbia while banded ferruginous hawks, red-tailed hawks and American kestrels nesting in northeast Colorado migrate to Texas and Mexico (Harmata, 1981; R. Ryder, unpublished data). Other potential migrants through the survey area include sharp-shinned hawk and turkey vultures (Craig, 1970). Peregrine falcons, listed as endangered under the Endangered Species Act, migrate through Northeast Colorado during spring and fall but appear to follow waterfowl migrations (Ryder, 1997). Since no waterfowl habitat exists within or near the project area, peregrine falcons are not expected to use the project area during migration.

The aerial survey conducted in 1997 prior to any construction activity was repeated in June, 1998 using the same study area, observer and survey methods (Reeve, 1998). Results of the 1997 and 1998 surveys are found in the table in Appendix C. In addition, an aerial survey of the project area and vicinity had been conducted in 1996 by a raptor biologist with the Colorado Division of Wildlife (see Appendix D).

Unfortunately trees in the 169 square mile survey area had attained full leaf growth by the time the 1998 aerial survey was conducted. In some cases, this prevented confirmation as to whether a nest structure observed in 1997 was active or inactive. In many cases, ground surveys to check these nests were not possible due to restricted access to private lands in the area. However, some nests in trees and nest structures on rock substrate, such as golden eagle and ferruginous hawk nests, were readily visible.

During the 1997 and 1998 aerial surveys no nests were observed in the original project area or the project expansion area. The closest nest structure to the project expansion area is a Swainson’s hawk nest located in a draw in Section 30 (Township 12 North, Range 66 West) that forms the southern boundary of the project expansion area. This nest was not active in 1997 and was confirmed to be inactive in 1998. The next closest nest to the project expansion area is a red-tail hawk nest located east of U.S. Highway 85 and more than 1.5 miles from the edge of the project expansion area. The closest golden eagle nest structure was located near Interstate 25

approximately four miles from the project expansion area. That nest structure had been blown off the cliff during a storm in 1998. The closest ferruginous hawk nest structure was found approximately four miles from the project expansion area. That nest was not active in 1997 or in 1998. The closest active ferruginous hawk nest was 5.5 miles from the project expansion area.

The project area and vicinity also have been the subject of field surveys of avian use, behavior and nests since the summer of 1997. Surveys have been conducted weekly during the summer, every two weeks during the migration seasons, and monthly during the winter. During the winter of 1997-1998, five surveys were conducted of the original project area and vicinity. In those surveys only a single golden eagle was observed flying a mile north of the project area and a single rough-legged hawk was observed perched on a power pole. In general, the surveys found that the project area and vicinity supports few birds between about October 15 and March 15 (Ryder, 1998; Kerlinger and Curry, 1998). During the spring migration, raptors arrive in the vicinity of the project area in March and April. Peak use of the project area and vicinity occurs in August. Between June and September 1997 approximately 30 sitings of raptors were made during the surveys—this includes birds off-site but visible from the project area. No nest sites were found during the on-ground surveys.

Passerines, Migratory Birds. Most of the birds likely to be found in the project area or vicinity, including the more common species, are defined as migratory birds by Federal regulations (50 CFR 10.13) and the Migratory Bird Treaty Act as implemented by Federal regulations (50 CFR 21). The USFWS issues permits for the following types of activities involving migratory birds: bird banding or marking; scientific collecting; taxidermy; waterfowl sale and disposal; special agriculturist; species purpose; falconry; raptor propagation permit; and, depredation control. According to federal regulations (50 CFR 21), a special purpose permit may be issued for activities related to migratory birds which are outside the scope of the other permits. However, the special purpose permit is intended to allow for activities that show benefit to the migratory bird resource, address important research reasons or involve some other compelling justification. According to Federal regulations (50 CFR 21.27), such a permit is required before any person may lawfully take a migratory bird for any purpose not covered by the standard permits. However, Federal regulations do not explicitly address an accidental or unintentional take of a migratory bird. No specific permit system is in place to allow for the incidental or accidental "take" of migratory birds due to collisions with buildings, towers, vehicles or wind turbines. The USFWS has recognized this as an unresolved regulatory issue.

Thirty-six species of passerines (e.g., songbirds) have been observed or might be expected to occur on the project area during breeding, during the winter, or for short periods during migration. During a May 1997 visit, horned larks and McCown's longspurs appeared to be the two most common species observed within the project area. Of the two, horned larks were most abundant. Western meadowlarks and loggerhead shrikes were also observed, although less frequently. Because no suitable nesting habitat for loggerhead shrikes was present, it is likely that the individuals observed were migrating through the area. Given the lack of nesting substrate diversity, ground nesting species are expected to constitute the majority of passerines in the

project area during the breeding season.

The route for the Nunn Breeding Bird Survey is 20 miles south of the project area but closer than any other route to the site. This survey is conducted annually by state agencies along a set route that allows year-to-year comparisons. The data is organized and maintained by the USGS Biological Resources Division. Although the Nunn route traverses a wider range of habitats than are present in the project area, data obtained the Nunn Survey provides information about regionally abundant species during the breeding period. According to that survey, the most common species were horned larks, lark buntings, and western meadowlarks (Sauer et al., 1996). McCown's longspurs, mourning dove, house sparrow, barn swallow, and killdeer are also frequently observed bird species (Sauer et al., 1996). These species would be expected to nest in the project area.

The highest species diversity in Northeast Colorado occurs during spring and fall migrations (Appendix C). Because the project area and vicinity contain no topographic features such as north to south drainages or ridges that might serve as natural corridors for the migratory movements of passerines, the density of birds migrating through the project area is likely to be low. In addition, the project area possesses no wetland, riparian or water features. During the winter months, horned lark and western meadowlark are likely to be the most abundant passerines but lapland longspur, snow bunting, house finch, black-billed magpie, American crow, and common raven may also be present.

Observations of passerine birds (songbirds) were made during the 1997-1998 field surveys initiated in Spring 1997 for the 1997 EA and continued since then by Dr. Ron Ryder (Ryder, 1998). Surveys have been conducted weekly during the summer, peak use season, every two weeks during the fall and spring migrations and monthly during the winter. Observations were also made at these times for mountain plover and bald eagle (see discussion below).

Observations of passerines (songbirds) have been dominated by a few species: McCown's longspur, lark bunting and horned lark (Ryder, 1998; Kerlinger and Curry, 1998). During the winter surveys only a few horned larks were observed after October 15. All other species of passerine birds were virtually absent from the project area and vicinity from October through March. Peak use of the project area by passerines appears to occur in August.

Passerine birds were observed to fly close to the ground and out of the sweep of the turbine blades. No bird kills from wind turbines have been observed and no carcasses from bird kills that could be attributed to collisions with wind turbines have been discovered in the course of the surveys (Ryder, 1998).

The project expansion area possesses no wetland, water or riparian features likely to be attractive to birds or to result in concentrations of birds. The project expansion area also lacks trees that could serve as nest or perch sites. Fences and the north-south power lines through the project area are the only source of perch sites.

No migration concentrations or pathways have been detected since field surveys began in 1997. During the field surveys, the only concentrations of birds observed in the project area and vicinity have been small flocks of songbirds (lark bunting, horned lark) found along roads and fence lines. On three occasions during the winter, small flocks of Canada geese were seen flying several hundred feet above the ground in the vicinity of the project area.

Amphibians and Reptiles. Based on species' typical ranges and habitat preferences (Hammerson, 1986; Baxter and Stone, 1980), two amphibian and 11 reptile species were identified as potentially occurring within the project area (Appendix C). The two amphibians--the tiger salamander and the plains spadefoot--require water for breeding. Several temporary ponds that quickly dry up within a few weeks are found in the intermittent drainage along the south edge of the project area. These ponds may be suitable habitat but this drainage would not be affected by proposed activities. Both species could use rodent burrows in the project area for shelter. Reptiles that could occur in the project area and vicinity include five species of lizards and six species of snakes (Appendix C). Although these reptiles are found in open grassy or sand hill areas, they usually require hiding cover such as small mammal burrows, woody debris, or rocks/rocky outcrops (Hammerson, 1986; Baxter and Stone, 1980)--the latter two conditions being absent in the project area.

The project expansion area does not include areas below the mesa rim or other areas that are likely habitat for these species.

3.15 Threatened, Endangered, and Species of Concern

The USFWS was contacted and asked to provide a list of Federally-listed species potentially affected by the proposed project. A copy of that list is found in Appendix D. Species identified in that letter have been addressed below and in chapter four.

Bald Eagle. Bald eagles do not nest in the region. Wintering bald eagles do congregate at ponds associated with the Rawhide Power Plant approximately 20 miles southeast of the project area. The plant's cooling ponds remain unfrozen during winter and attract waterfowl and, consequently, bald eagles (Ryder, 1997). Wintering bald eagles will commonly use communal roosts in trees that provide shelter from wind and low temperatures. Concentrations of wintering bald eagles tend to be found in trees or cliffs along lakes, streams or river courses. Where food availability coincides with water bodies, perches are usually trees. Selectivity of perches by bald eagles appears to favor dead trees and deciduous trees having substantial horizontal branches (Stalmaster and Newman, 1979; Steenhof et al., 1980) such as cottonwoods in riparian zones. No suitable roosting habitat or perch sites are present within the project area. Similarly, nesting attempts are usually made in that type of habitat. A field inspection of the project area and vicinity found no signs nesting or nest structures. Power lines along the east boundary of the project area could be used for perching. No nests were observed in these towers during the 1997 raptor survey (Reeve, 1997) and during a search of the project area and vicinity conducted by the CDW (see Appendix D).

Because suitable roosting areas may not be close to food sources, bald eagles will travel significant distances between the two. Carrion can be an important winter food. It is possible that an occasional bald eagle could pass through the project area in search of food sources such as road-kill, dead cattle or other sources of carrion. Otherwise, this species would be unlikely to occur in the project area.

The low probability of bald eagles species occurring in the project expansion area has been confirmed by field studies. No bald eagles or nest structures were observed during aerial surveys conducted in Spring 1997 and 1998 of a 169 square mile area centered on the project site. No individual bald eagles have been observed during any of the field surveys of the project area and vicinity that commenced in Spring 1997 and which have continued through 1998.

Mountain Plover. Mountain plover, a candidate for Federal listing as endangered or threatened under the Endangered Species Act, inhabit semi-deserts and disturbed prairies throughout the western Great Plains. They nest in areas of low herbaceous vegetation, reduced shrub cover, and near prominent objects such as cow-manure piles or similar-sized rocks (Graul, 1975; Knopf and Miller, 1994). Frequently they have been associated with prairie dog towns where vegetation has been reduced (Knowles et al., 1982; Olson-Edge and Edge, 1987). Although this species breeds at many locations across the western Great Plains, the two hubs of plover breeding activity appear to be the Pawnee National Grassland in Colorado and the Charles M. Russell National Wildlife Refuge in Montana (Graul and Webster, 1976).

Because of the presence of suitable habitat near the project area and the proximity to the Pawnee National Grassland, the USFWS has expressed concern that the mountain plover may occur in the project area. PSCo requested the USGS Biological Resources Division to conduct a field inspection. An inspection by an experienced grassland ornithologist (Dr. Fritz Knopf) was conducted on September 4, 1996. Although no plovers were observed during the inspection, some potential was found for plovers to nest within the project area. This would be more likely to occur if cattle were allowed to continue grazing in the area (see Appendix D). During various field surveys, no prairie dog towns were found within the project area or on adjacent land (Reeve, 1997).

The project expansion area is outside of the Pawnee National Grassland, the prime habitat of the mountain plover. No mountain plover were observed during any of the field surveys which commenced in Spring 1997 and which have continued through 1998. No prairie dog activity has been observed in the project area or vicinity during 1997 and 1998 field surveys.

Swift Fox. The swift fox, a candidate for listing as endangered or threatened under the Endangered Species Act, is found in short-grass and mid-grass prairies over much of the Great Plains. In Northeast Colorado, this fox may be most numerous in flat to gently rolling terrain (Cameron, 1984; Loy, 1981) and rare in areas with highly eroded gullies, washes, and canyons (Fitzgerald, 1994). As carnivores, they feed on lagomorphs, ground squirrels, prairie dogs, mice, invertebrates, and ground-nesting birds. In many areas--including Colorado--cottontails and

jackrabbits are the bulk of their diet (Cameron, 1984; Zumbaugh et al., 1985). It has been suggested that swift fox population will decline during periods of low rabbit densities (Fitzgerald, 1994).

A variety of predators, including coyotes and golden eagles, prey on swift fox. Covell and Rongstad (1990) have suggested that high coyote densities may serve to limit swift fox numbers. Furthermore, because swift fox are quite easy to trap, humans may be another, major cause of mortality. Coyotes observed inhabiting the vicinity of the project area may preclude its use by swift fox.

Swift fox have not been observed during any of the field surveys which have been conducted by qualified wildlife biologists. The lack of rabbits or other prey observed during field surveys of the project area and vicinity suggests that this species is unlikely to occur in the project expansion area or vicinity.

Colorado Butterfly Plant. The Colorado Butterfly Plant (*Gaura neomexicana* ssp. *coloradensis*) is a member of the Evening Primrose Family (Onagraceae) and a Federal candidate for listing as endangered or threatened under the Endangered Species Act. It is infrequently found in scattered sites on the plains and piedmont valleys of Boulder, Larimer, and Weld Counties, Colorado and Laramie County, Wyoming (Fertig, 1994; Weber and Wittmann, 1996). Data obtained from the Wyoming Natural Diversity Database (April 1997) indicated that it is currently known from 21 populations in Laramie County and several historic sites in northern Colorado. It tends to grow in sub-irrigated, alluvial soils of drainage bottoms surrounded by mixed grass prairie (Dorn, 1992; Fertig, 1994)--conditions not found within the proposed project area. Although a plant survey has not been conducted, the lack of suitable habitat conditions, along with intensive grazing, appear to preclude its occurrence within the project area.

Due to intensive grazing, and the lack of drainage bottoms and suitable habitat, this species is not expected to occur in the project expansion area.

CHAPTER FOUR
ENVIRONMENTAL IMPACTS OF PROJECT ALTERNATIVES

4.1 Introduction

This chapter contains an examination of impacts on the affected resources discussed in chapter three. In chapter three, several resources were identified which, due to their lack of presence in the project area or the nature of the Proposed Action, were eliminated from consideration as part of the affected environment. Those resources are not considered further in this chapter. This analysis considers impacts due to the staged development of up to 27 wind turbines within the project area. Cumulative impacts are considered in chapter five.

Since DOE completed the environmental assessment of the project in August 1997, the scope of the project has changed. For the purposes of this EA, up to 48 turbine locations have been identified within the project area. This chapter addresses environmental impacts associated with the expanded project. Cumulative impacts of the original and expanded project are considered in chapter five.

4.2 Streams, Wetlands and Floodplains

A significant impact would occur if wetlands, natural stream channels and riparian areas were irretrievably lost or the threat of flood damage was substantially increased. Violation of Executive Order 11988 or 11990 would be considered a significant impact. None of these impacts are expected to occur.

This conclusion is applicable to the expanded project area as well.

4.2.1 Proposed Action

No perennial streams would be directly or indirectly affected by project activities. The project area is a flat, dry mesa that sits above local intermittent streams and drainages and any wetlands or floodplains associated with them (see Figure 2-1). Use of existing access roads as the proposed access would avoid creating impacts to the few isolated wetlands or riparian areas found in the vicinity. Improvements to the existing access road would not affect wetland or riparian areas. The proposed 0.2 miles of new access road would avoid wetlands and riparian areas. No wetlands would be affected by the construction of the turbines, feeder lines or substation. The only intermittent stream found in the project area is at the southern edge of SW 1/4, Section 19 (see Figure 2-2) and would not be crossed by access roads. The locations of turbines would also be adjusted to avoid this area (see Figure 2-2).

Executive Order 11988 (42 FR 26951) addresses the protection of floodplains. Executive Order

11990 (42 FR 26961) addresses avoidance of adverse impacts associated with the destruction or modification of wetlands associated with new construction. DOE is prohibited from undertaking or providing assistance for new construction located in wetlands or floodplains unless the agency finds that there is no practicable alternative to the construction and that the action includes all practicable measures to minimize harm to these areas. The project would comply with these Executive Orders as construction in floodplains and wetlands would be avoided.

All proposed activities would occur on the mesa top outside of these areas. No additional access roads are proposed for construction. Construction or operations would not affect wetlands, streams, riparian areas, ponds, and floodplains. As proposed, the expanded project would comply with Executive Order 11988 and 11990.

4.2.2 No Action Alternative

Implementation of the No Action Alternative would have no substantial effect, positive or negative, on the protection of streams, wetlands or floodplains.

This conclusion is applicable to the expanded project area as well.

4.3 Water Quality

An activity that results in a violation of Federal, state or local ambient water quality standards would be considered a significant impact. Given the lack of water bodies in the project area, no such impacts are likely to occur.

This conclusion is also applicable to the expanded project.

4.3.1 Proposed Action

Permanent water bodies or perennial streams would not be affected. The intermittent drainage at the south edge of the project area would be avoided. Given these conditions, the proposed use of existing access roads, and the implementation of erosion control and reclamation measures described in chapter two, no impacts to water quality associated with sedimentation or alternation of stream channels are expected to occur

As proposed no stream channels would be affected; this conclusion is also applicable to the expanded project.

4.3.2 No Action Alternative

Implementation of the No Action Alternative would have no impact, positive or negative, on surface water quality.

This conclusion is applicable to the expanded project area as well.

4.4 Soils and Vegetation

Failure to stabilize soils where vegetation cover has been removed would be considered a significant impact. Given the minimal surface disturbance involved and proposed reclamation measures, no such impact is expected to occur.

This conclusion is also applicable to the expanded project.

4.4.1 Proposed Action

Potentially affected soils are non-hydric and are well-drained with a high sand and/or gravel content. Affected soils are not expected to result in any unusual or difficult construction problems. According to the soil survey (SCS, 1982), the potential for soil erosion by water is slight; however, there is a relatively high potential for wind erosion of disturbed areas. Some disturbance to soils and vegetation would be unavoidable and necessary for access road improvements and the construction of feeder cables, turbine sites and the electric substation. Due to the flat (0-3 percent slope) topography of the project area and the type of foundation proposed, only minimal grading is expected to be necessary for turbine sites. Use of existing access roads will minimize new soil disturbance and road construction. Affected soils are generally well-drained and should provide an adequate road base. Trenches for underground feeder and communication cables would not require grading and their construction should create only minimal disturbance to soils and vegetation. By not grading the trench line, root systems of the prairie vegetation would be kept intact and the potential for wind erosion reduced. For safety reasons, the area inside the substation must be kept clear of any vegetation. However, soils in this area would be covered with gravel or otherwise stabilized.

Construction in 1998 of a feeder line and the substation, along with reclamation of a relocated road, demonstrate that these practices can be implemented, that disturbance to soils and vegetation can be minimized, and that successful reclamation of disturbed areas can be achieved.

It is estimated that construction of 0.2 miles of new access road would disturb about 0.3 acres. The substation would require 0.9 acres of surface disturbance. The foundations of 27 towers would disturb about 0.25 acres but areas under towers would be reclaimed and revegetated. Installation of feeder lines would disturb about 0.25 acres for every mile of feeder line installed but his area also would be reclaimed and revegetated. Graveling or leveling portions of the existing access road and the need for unimproved, two-track roads to service turbine locations would result in a small, unquantifiable increase in disturbance to soils and vegetation.

Due to the flat topography of the mesa top, no grading is required for the tower and turbine assembly areas. Two-track trails would be used to access individual turbine locations in the

project expansion area. Compared with a lattice tower, a tubular tower requires a more substantial reinforced concrete foundation. An area approximately 50 feet by 50 feet is disturbed to accommodate excavation and installation of the foundation. An estimated 2.75 acres of soil and vegetation would be disturbed if all 48 potential wind turbine sites were utilized. Trenching of feeder lines to an individual turbine location in 1998 demonstrated that disturbance could be limited to an area two feet wide or less.

PSCo would reclaim any disturbed soils not needed for maintenance or operations. Reclamation would use species adapted to local precipitation and soil conditions. Seed for these species (such as blue grama grass, needle-and-thread, buffalo grass or western wheatgrass) is generally available. Affected soils are well-suited for a variety of grain crops and reclamation potential is expected to be good. Seeding in the fall or early spring to take advantage of available moisture should enhance seed germination and reclamation success. However, reclamation success would depend upon the timing of the unpredictable and generally low precipitation characteristic of the area. Grazing pressure could also affect the success rate. Repeat seeding of disturbed areas may be necessary. Fertilization is not recommended and none has been proposed. Use of mulch would be difficult given the high winds characteristic of the mesa top. Minimum tillage and leaving the surface in a roughened condition is likely to be more effective in protecting soils from wind erosion and in trapping seed and moisture. PSCo has proposed the control of noxious weeds to ensure that disturbed areas are properly reclaimed with native species. With stabilization of disturbed areas as proposed, long-term impacts to soils and vegetation are expected to be minimal.

Reclamation of disturbed area undertaken in 1998 demonstrated that successful revegetation of disturbed areas can be achieved. Reclamation of the expanded project area is expected to be successful and to result in no long-term impacts to soils or vegetation apart from those associated with continued livestock grazing. Mulch—straw crimped into the soil--was successfully used to improve reclamation success during 1998. These practices are also expected to be successful in the project expansion area.

4.4.2 No Action Alternative

Implementation of the No Action Alternative would avoid short-term disturbance to soils and vegetation associated with construction activities and a small amount of long-term disturbance associated with service roads, the substation and turbine sites. Some increased potential for soil loss due to erosion also would be avoided.

Given that some turbines have already been constructed, implementation of this alternative would avoid only a small amount of disturbance associated with turbine installation.

4.5 Meteorology and Air Quality

Exceeding Federal or state ambient air quality standards would be a significant impact. No such

impacts are expected to occur. The project would help reduce future emissions of regulated pollutants.

The expanded project decreases future emissions of regulated pollutants associated with fossil fuel burning.

4.5.1 Proposed Action

Meteorology. Based on data gathered from the existing meteorological tower and a tower in Cheyenne, the proposed site appears to have excellent wind potential. Future data gathered from the meteorological tower would be used to refine estimates of potential electricity production from the turbines. Additional meteorological data generated by the project would be valuable to the State of Colorado for its wind monitoring studies and assessment of the commercial feasibility of other sites.

Additional meteorological data has been collected and would continue to be collected as part of the expanded project. This data has confirmed the site to be an excellent location for wind turbines.

Air Quality. Using wind power would have a positive impact on regional air quality--particularly where it displaces the need for fossil fuel burning in non-attainment areas. Consumers choosing to purchase wind-generated electricity would reduce their contribution to the regional inventory of emissions. Assuming development of all 27 wind turbines and the use of best available pollution control technologies on a gas-fired power plant, implementation of the Proposed Action would avoid the production of 29,860 tons of carbon dioxide, 0.04 tons of sulfur dioxide, 67.7 tons of carbon monoxide, and 12.9 tons of nitrous oxides each year.

Assuming the construction of wind turbines at all identified locations and extrapolating from PSCo derived calculations, it is estimated that the expanded project could potentially mitigate the production of upwards of 52,000 tons of carbon dioxide, 0.07 tons of sulfur dioxide, 119 tons of carbon monoxide, and 22 tons of nitrous oxides each year in avoided new fossil fuel power plant construction.

Construction of the proposed wind project would reduce demands on fossil-fuel power plants and would reduce the production of greenhouse gases and regulated sources of emissions associated with fossil fuel burning. PSCo estimates that in 1996 it was necessary to burn one ton of coal to produce 1800-1900 kWh. An average household in PSCo's service area consumes about 580 kWh of electricity a month or the equivalent of about one-third ton of coal per month. Based on its estimated output, one wind turbine could displace 940 tons of coal burning each year. At full development, 27 turbines could displace more than 25,000 tons of coal burning per year.

Extrapolating from PSCo derived caluclations, it is estimated that if all identified potential wind turbines were constructed more than 40,000 tons of coal per year could displace in the future.

Construction of the wind project would result in a temporary, localized increase in particulate matter and emissions from vehicle and equipment exhaust. However, impacts from vehicle operations would be confined to the 90 days it would take to install and test wind turbines and related facilities. Construction activities would create a temporary increase in fugitive dust. However, this source would be reduced once affected soils are stabilized. Because the project area is far from any Class I area and is not within any non-attainment area for criteria air pollutants, its construction and operation are not expected to have any adverse effect on compliance with Federal or state air quality regulations.

Construction of all potential wind turbines at the Ponnequin site would occur over a longer period than that analyzed in the August 1997 EA. However, actual construction activities related to the generation of fugitive dust typically take less than 90 days for a wind turbine. Otherwise, this discussion and its conclusion are applicable to the expanded project.

4.5.2 No Action Alternative

Implementation of the No Action Alternative would avoid a temporary increase in fugitive dust and emissions from construction equipment; however, it would also result in the loss of positive impacts on air quality associated with reduced fossil fuel burning.

This conclusion is applicable to the expanded project area as well.

4.6 Socioeconomic Conditions

An increase in the demand for public services or housing that exceeds local availability or capacity would be considered a significant impact. A substantial decrease in local property values that results in a substantial decrease in County property tax revenues would be considered a significant impact. Based on the small size of the workforce involved, the site's distance from any residents or residential area, and the enhanced tax revenues likely to be produced by the project, no such impacts are expected to occur. Imposition of an unwanted facility on a disadvantaged population would be considered a significant impact. No such impact would occur as the project is not located near such a population and the project has been modified to reflect the wishes of local landowners.

This conclusion is also applicable to the expanded project. Existing project activities have been modified as necessary to accommodate the local landowners who have granted a long-term easement for the Phase I in the current project area, as well as access to the expanded project area. The project expansion area does not involve any private land or any additional access across private lands.

4.6.1 Proposed Action

The proposed facility would not impose any environmental risks, nuisances or adverse socioeconomic impacts on a socially or economically disadvantaged ethnic group or area. The access road has been adjusted to reflect the requests of private landowners. Owners of the project area have willingly granted approval for the use of their property.

No additional access roads are proposed. This discussion is also applicable to the expanded project area.

Imposition of the state's five percent sales and use tax on applicable purchases of materials, supplies and equipment for the project would generate additional state revenues. For Weld County, the conversion of unimproved range land to a wind project would increase property tax revenue derived from the project area which currently produces about $113 a year in property tax revenue. Implementation of additional project phases would generate additional revenues for the County. Increased tax revenues derived from the project could be used to support education and County services.

In addition to increased revenue from these sources, the project expansion area involves State land under grazing leases that return approximately $1.75 per acre per year to the State in grazing fees. The revenue generated from leases on these State lands is used to fund public education (grade schools, high schools) in the State of Colorado. Grazing, and therefore revenue from grazing leases, could continue. Moreover, public education in the State could receive additional revenue from a lease associated with the expansion of the wind energy project onto State lands. These revenues would be dependent upon the lease issued by the Colorado Board of Land Commissioners.

4.6.2 No Action Alternative

Implementation of this alternative would result in private property owners' loss of income and the loss of increased state sales-use tax and County property tax revenues.

An opportunity to increase revenues from State lands which are used to fund public education could be lost if the project expansion does not occur.

4.7 Energy Resources

The loss of proven, commercial renewable energy resources would be considered a significant impact. The unnecessary, increased use of fossil fuels would be considered a significant impact. No such impacts are expected to occur as a result of the Proposed Action.

This conclusion is also applicable to the expanded project.

4.7.1 Proposed Action

The Proposed Action would result in several positive impacts on energy resources in the U.S. First, the data and experience gained from the proposed facility could improve the position of U.S. industries to compete abroad--offering renewable energy technologies as well as planning, engineering and other services to developing countries.

Second, the project would avoid the need to construct new transmission lines to a new generation site as lines for an interconnection are adjacent to the project area. Thus, the proposed site is well situated to improve energy efficiency by reducing system losses.

Third, price is the major market barrier to the increased use of renewable energy technologies. When compared with existing PSCo rates, the price premium for wind-generated electricity could be substantial (i.e., much higher than $0.025/kWh associated with the Proposed Action). If DOE releases project funding, the premium paid for wind-generated electricity would be reduced to about $0.025/kWh. This would have the beneficial impacts of increasing consumers' and businesses' willingness to participate in a green energy program.

Fourth, by helping to sponsor this venture, DOE funding would have the positive impact of contributing to an improved understanding of wind turbine design, equipment, operations and reliability. The improvements suggested by this venture could reduce the cost of future equipment and projects and increase the adoption of these technologies at other sites.

Finally, the Proposed Action would help diversify U.S. and Colorado energy resources and would reduce the consumption of non-renewable, fossil fuels. It would offer thousands of customers an alternative to the increased consumption of fossil fuels. PSCo estimates that an average Front Range household in its service area consumes about 580 kWh/month. Depending upon actual net energy output, one of the proposed wind turbines could supply the equivalent of electricity consumed by 244 households with the full project (27 turbines) providing the electrical needs of more than 6,500 households. Actual output will depend upon wind conditions, operating efficiencies and other variables.

This discussion also is applicable to the expanded project. If all potential wind turbine sites identified were developed, the power generated could be the equivalent of the electricity consumed by over 11,000 Front Range households.

4.7.2 No Action Alternative

Under the No Action Alternative DOE would not assist in construction of the Ponnequin Wind Energy Project. Without DOE participation, consumers would pay a higher premium for wind-generated electricity and citizen participation in the program would likely be lower. Fewer turbines would be installed within the project area or it is possible that the project would prove infeasible to construct. Colorado consumers would lose the option of purchasing electricity

generated from a renewable energy source. Colorado-based businesses, workers and scientists would lose an opportunity to expand their participation in the renewable energy field.

This conclusion is applicable to the expanded project area as well.

4.8 Noise

A violation of applicable Federal, state or local noise standards would be a significant impact. The project-related generation of noise levels greater than 55 dBA at occupied residences would be considered a significant impact. No such impacts are expected to occur.

This conclusion also is applicable to the expanded project.

4.8.1 Proposed Action

Executive Order 12088 requires conformance with applicable state and local noise standards. No specific state or local noise standards are known to apply to the operation of wind turbines in the project area.

The project area is not considered a residential, commercial or industrial area as defined by the Colorado Noise Code. Noise in agricultural areas, such as the project expansion area, is not specifically regulated under the Code.

Because they would be a new design, noise levels generated from the proposed turbines have not been determined at this time. In general, all wind turbines produce two types of noise: a low frequency noise that can be perceived as a thumping sound and a higher frequency, more continuous noise from gearboxes and airflow over turbine blades or through lattice towers. Perception of these noises will depend upon many physiological, environmental and turbine design factors. A noise study of a massive horizontal axis turbine with a 290-foot diameter upwind-rotor found that noise reached the limits of human observers' perception at 3,200 feet upwind and 6,400 feet downwind of the tower. The proposed type of turbine would be expected to generate much less noise (Spera, 1994). In any case, no residences are located less than 1.5 miles from the project area. An another example, early model turbines were reported to generate noise levels of 45-50 decibels at the base of the tower (Nelson and Curry, 1995). By contrast, the level of normal human speech is 55-60 dBA (Golden et al., 1980). Noise from high winds characteristic of the area, major highways (e.g., Interstate 25, U.S. Highway 85) and a railroad are likely to affect background noise levels and the perception of noise impacts in the vicinity of the project area. For these reasons noise impacts are expected to be negligible.

The proposed turbines operate at a lower number of revolutions per minute than the Zond turbines that were originally proposed for use at the site. Due to the very low (15-22) revolutions per minute, the turbines are expected to be inaudible at the closest residence and noise-related impacts are expected to be negligible.

4.8.2 No Action Alternative

Implementation of the No Action Alternative would avoid an increase in noise within the project area but otherwise would not affect background noise levels at residences or other noise sensitive areas.

This conclusion is applicable to the expanded project area as well.

4.9 Transportation

A significant impact would occur if the project increased traffic volumes on Federal, state or County roads to the extent that average vehicle speeds were reduced, traffic flows were disrupted, and an increase in the traffic accident rate occurred. Based on the size of the proposed project and its phased development, none of these impacts are expected to occur.

This conclusion is also applicable to the expanded project.

4.9.1 Proposed Action

Because access into the project would be controlled (consistent with landowners' requests), they would be protected from increased, traffic-related impacts other than those necessary to construct and operate the project. The access road would be minimally improved to serve construction and operations traffic. Improved road conditions and PSCo maintenance of the access road would benefit local landowners by providing them with improved access to their property and livestock.

To date access into the project area has been constructed and maintained consistent with these conditions. This conclusion is applicable to the expanded project area as well. However, in the future after all construction is completed, there is a potential for the site to see periodic visits from school children and wind energy related interested parties. This would translate to infrequent, low volume, vehicular traffic into the wind site over existing access routes. This might equate to as much as one-two bus loads per month dependent upon the time of year. No significant environmental impact is foreseen from such occurrences.

Peak traffic levels associated with the proposed project are unlikely to produce a noticeable increase in traffic on U.S. Highway 85, State Highway 223 or Interstate 25. Construction-related traffic would last for approximately 90 days. As proposed, the existing junction of the access road and State Highway 223 would be constructed and maintained in conformance with Wyoming Department of Transportation requirements which would help ensure that the potential for accidents at this intersection is minimized. Heavy truck traffic would end once construction has been completed. No impacts from heavy truck traffic would be associated with facility operations. After construction has been completed, project-related traffic on access roads into the project area would decrease to less than 1-2 light vehicle-trips per day.

A temporary increase in heavy truck traffic associated with construction of the substation has already ended. Construction of individual turbines associated with the project expansion would occur over an extended period. However, the construction of any one turbine takes less than 90 days. Heavy truck traffic is only associated with the transport of the wind turbine to the site (less than 10 truck-loads) and cement trucks needed to pour foundations. The completed entrance to State Highway 223 allows for good visibility of on-coming traffic. Because the facility would be remotely monitored, only a minimal number of trips by light truck to the facility would be needed during routine operations. The use of the erection crane has very minimal impact to traffic.

4.9.2 No Action Alternative

A slight, short-term increase in traffic volume on area roads and highways would be avoided. Otherwise, implementation of the No Action Alternative is not expected to have any measurable effect on traffic levels, road conditions, or accident rates on Federal, state or county roads or highways. Improvements to the existing road used to reach the project area would not be made if the project were abandoned.

This conclusion is applicable to the expanded project area as well.

4.10 Cultural Resources

Loss of cultural resources eligible for the National Register of Historic Places would be a significant impact. A violation of Federal regulations protecting cultural resources would be a significant impact. Based on the results of the cultural resources survey, no such impacts or violations are expected to occur.

This conclusion is applicable to the expanded project area as well.

4.10.1 Proposed Action

The isolated finds identified during the on-site survey (discussed in chapter three), by their nature, are considered to lack significance and cannot be considered eligible for listing on the National Register of Historic Places. Therefore, no further work has been recommended for these finds. The limited cultural resources present, both of the prehistoric and historic eras, are likely due to the absence of a nearby reliable water source and the topography of the project area. Findings of the cultural resources survey indicate that implementation of the Proposed Action will be unlikely to affect significant cultural resources. While an increased but unknown potential to disturb subsurface sites would be unavoidable, the risk of this impact is likely to be low given the findings of the cultural resources survey. In June 1997 the DOE provided the SHPO with these results and conclusions. No comments challenging these conclusions have been received.

Based on the additional cultural resources survey completed in 1998, three prehistoric sites are of undetermined eligibility and potentially may be eligible for inclusion on the National Register

of Historic Places. If procedures are implemented to avoid these three sites during construction activities, no impacts or violations are expected to occur.

Based on the results of the 1998 cultural resources survey submitted to the SHPO (Harrison and Tate, 1998), no further work has been recommended for the isolated finds discovered in the project expansion area. Of the five prehistoric sites identified in the survey of the project expansion area, two are considered not eligible for listing on the National Register of Historic Places and no further work has been recommended for these sites. The three stone circles discovered within the project expansion area are in need of further data to assess their National Register eligibility. The archaeologists completing the survey of these sites (Harrison and Tate, 1998) recommend that these sites be avoided and protected (for example with fencing) during construction activities to avoid adverse impacts. Because these measures have been incorporated into the Proposed Action, implementation of the expanded project would be unlikely to adversely affect cultural resources in the project expansion area.

4.10.2 No Action Alternative

Implementation of the No Action Alternative would avoid a small risk of disturbing subsurface sites. Otherwise, implementation of this alternative would have no effect on the protection of significant cultural resources.

This conclusion is also applicable to the expanded project.

4.11 Visual Resources

A significant impact would occur if the proposed project introduced visual elements not currently found in the vicinity of the project area which would disrupt views from designated, regionally-significant scenic overlooks. No such areas occur and no such impacts would be introduced by the project.

This conclusion is also applicable to the expanded project.

4.11.1 Proposed Action

Rotors from turbines within the project area could be visible in the distance from portions of U.S. Highway 85, Interstate 25, Interstate 80, Highway 223, and parts of Cheyenne, WY. Due to its slim profile, the lattice tower would be very difficult to see from these highways. Where visible, the turbines would appear as small structures on the horizon that would not be substantially different in visual impact from the towers of major transmission lines already visible near the project area. Scenic vistas of undisturbed, natural landscapes would not be affected. Existing visual resources in the vicinity of the project area already compromised by the presence of transmission towers and lines, telephone lines, a railroad, highways and roads, pipeline corridors, windmills, and radio and communication towers. Visually sensitive areas such as natural areas,

parks, or scenic overlooks would not be affected.

The proposed tubular towers would be more visible than lattice towers; however, the visibility of turbine blades would be equivalent. Visibility, however, is a key element in reducing avian impacts (see discussion in the wildlife section that follows).

Visibility would be dependent, in part, upon an observer knowing the location of the facility as it is only intermittently visible from area roads. Views often would be restricted by local topography. The project expansion would not adversely affect visually sensitive areas.

4.11.2 No Action Alternative

Implementation of the No Action Alternative would not protect any previously identified scenic resources from adverse impacts.

This conclusion is applicable to the expanded project area as well.

4.12 Land Use

A significant impact would occur if the project introduced a new land use that was not allowed by the County under its County Code. Such an impact is not expected to occur as the County has approved the Land Use Permit for this project.

Given that the existing land use (i.e., cattle grazing) of the project expansion area could continue, and that PSCo will continue to work with Weld County and the State Land Board to ensure compliance with applicable codes and regulations, no adverse impacts are expected to occur as a result of the project expansion.

4.12.1 Proposed Action

Construction of the proposed project requires a Land Use Permit (i.e., a Use by Special Review Permit) from Weld County for a major facility of a public utility. Compliance with this permit process would ensure compatibility with existing and proposed land uses. Assuming compliance with the requirements of the permit approved by Weld County in June 1997, no adverse impacts on land use are expected to occur.

Expansion onto adjacent State lands would require the approval of the Colorado Board of Land Commissioners.

4.12.2 No Action Alternative

Lack of DOE funding could discourage the construction of the project and conversion of the project area from range land to a wind energy facility. However, if PSCo still proceeded with the project, and assuming compliance with Weld County land use permits, implementation of this alternative would have no impact (positive or negative) on land use.

This conclusion is applicable to the expanded project area as well.

4.13 Public Health and Safety

A substantial increase in risk to public health and safety, beyond that already associated with existing structures, land uses, and activities found in the project area and vicinity, would be considered a significant impact. Given the remoteness of the site, its lack of public access, and the proposed compliance with applicable Federal health and safety regulations, no such impacts are expected to occur.

This conclusion is applicable to the expanded project as well.

4.13.1 Proposed Action

Four potential threats to public health and safety would be associated with the project: collapse or dismemberment of a turbine in the case of extremely high winds or a tornado; electrocution; a fall from a tower; and aircraft collision. Electrocution or a fall by a member of the public would require that person to illegally enter the proposed facility. Given the remoteness of the location, the lack of nearby homes and the proposed, continued restriction on public access, there is a very low risk of this impact. Compliance with FAA requirements would minimize the risk of an aircraft collision. The turbines and towers would be designed to withstand winds higher than those reported by the project area meteorological tower and a similar tower in Cheyenne, Wyoming. To avoid damage from high winds, turbines could be shut down in accordance with manufacturer and PSCo-approved procedures. Operations and maintenance personnel would be trained in these procedures.

Implementation of the expanded project would be consistent with this discussion.

4.13.2 No Action Alternative

Implementation of the No Action Alternative would avoid a slight increase in the risk of an adverse impact to public health and safety.

This conclusion is applicable to the expanded project area as well.

4.14 Wildlife

Any project-related activity that would decrease wildlife populations due to the loss of habitat crucial for fawning, winter feeding or watering would be considered a significant impact. Any project-related activities that would disturb active raptor nests would be considered a significant impact. Based on the analysis presented below, no such impacts are expected to occur.

Based on the results of biological studies undertaken since Spring 1997, no such impacts are expected to occur as a result of activities in the project expansion area.

4.14.1 Proposed Action

The Proposed Action could adversely affect wildlife in three ways: by direct mortality, habitat loss, or displacement of wildlife away from the project area. First, wildlife fatalities could occur from collisions with turbine blades, support towers, meteorological towers, collisions with construction and/or maintenance vehicles. Fatalities might also occur during excavation and surface preparation for the turbines, feeder lines and communication cables, and the substation. Wildlife fatalities due to avian collisions with turbines blades and other structures are considered in subsequent sections.

Clearing, grading, excavating, trenching, and/or burying habitats could lead to mortality of small mammals, reptiles, amphibians, invertebrates and nesting birds with eggs or young. Burrowing vertebrates would be especially vulnerable. Depending on species and soil characteristics, pocket gopher burrows are usually less than two feet deep (Chase et al., 1982). Burrows of thirteen-lined ground squirrels may be 20 feet long but only one foot deep; and Wyoming ground squirrels may burrow to depths of seven feet (Nowak, 1991). Rodent burrows may also be inhabited by spadefoot toads, salamanders, lizards and snakes, mice, weasels and birds, particularly burrowing owls (Chase et al., 1982; Clark et al., 1982). Loss of animals in burrows from excavation activities, if they occur at all, are only likely during construction of feeder line trenches and grading of the substation and turbine sites.

Observations made by a wildlife biologist conducting studies in the project area and vicinity since before the start of construction found low numbers of rodents in the area. Thus the likelihood of this impact appears to be low. The minimal amount of surface disturbance required for turbine foundations and feeder lines, and the use of two-tracks (rather than graded roads) to access turbine locations, further reduces the likelihood of this impact.

Construction machinery and project-related vehicles could collide with wildlife. Wildlife species particularly vulnerable to collisions with vehicles are those that move slowly, are inconspicuous, and/or nocturnal. Wildlife most susceptible to vehicle-related death include skunks, cottontails and jackrabbits, deer, coyotes, badgers, snakes, amphibians, and birds, particularly those such as mourning doves and meadowlarks that inhabit grasslands and shrubs next to roads (Leedy, 1975; Case, 1978; Wilkins and Schmidly, 1980). While increased construction traffic temporarily increases the risk of wildlife mortalities, overall impacts on wildlife populations are not anticipated to occur.

Any potential increase in the probability of this impact would be temporary and confined to the relatively short period needed to install wind turbines.

A second source of impact would be associated with the loss from excavation and grading activities of short-grass prairie habitat (blue gramma, needle-and-thread, prairie sandreed grasses, prickly pear cactus, yucca). Surface disturbance and long-term loss of short-grass prairie habitat would be reduced by reclamation, using existing access roads, limiting new road construction to 0.2 miles, limiting road widths to 12 feet, only minimally improving existing roads (rather than constructing standard crown-and-ditch roads), and using two-tracks for service roads to turbine sites. Disturbance to vegetation cover at each turbine site would be limited to about 400 square feet of short-term disturbance around the base of the lattice tower. This equates to 0.25 acres of disturbance for 27 turbines. An estimated 0.9 acres would be disturbed over the long term within the fence of the substation. An undetermined but a minor amount of short-term disturbance also would be associated with digging trenches for buried feeder lines and communication cables. Trenching each mile of feeder line and communication cable would result in about 0.5 acres of disturbance. Construction of the proposed 0.2 miles of new access road would disturb about 0.3 acres of surface disturbance.

Activities in the project expansion area would be consistent with this discussion. However, due to the use of a tubular tower for Phase I, total disturbance associated with development of all potential turbine sites could results in an increase of an estimated 2.75 acres. All of this, except for a concrete collar to which the tower is attached, would be reclaimed and revegetated. No crown and ditch roads have been proposed within the project expansion area. The substation has been installed and areas not needed for operations reclaimed. Based on field observations, trenching of each mile of feed cable is expected to temporarily disturb 0.25 acres. Construction of the access road has been completed and no new access road into the project expansion area has been proposed.

The third, general source of impact would be displacement of wildlife away from construction activities and operating turbines. Noise, machine activity, and dust from construction typically displaces birds, mammals, and other species beyond the actual construction site (Hanley et al., 1980). In addition, studies have shown that densities of some species of nesting birds decreased in fields near well traveled roads (van der Zande et al., 1980). Reports show that various mammals and birds escape from noises at 75 to 85 dBA (Golden et al,. 1980). Heavy equipment used in construction can emit noise levels within the 75-85 dBA range at distances beyond 200 feet (Golden et al., 1980). Displacement of wildlife during construction is expected to be temporary, if it occurs at all, and is not expected to adversely affect populations of resident or migratory species.

While no systematic study of displacement from the project area has been undertaken, herds of antelope have continued to be observed in the project area and project expansion area during construction activities and during the operation of one wind turbine constructed earlier in 1998. Excavation equipment used to construct foundations have been equipped with mufflers.

Otherwise the only heavy equipment routinely involved in project construction is a crane and cement trucks.

Although noise levels generated by the Z-46 or similar turbines have not yet been determined, early turbines were reported to generate noise levels of 45-50 decibels at the turbine base (Nelson and Curry, 1995). By contrast, normal human speech levels are 55-60 dBA (Golden et al., 1980) and sound produced under windy conditions in montane aspen and conifer stands can reach 56 dBA (Ward et al., 1976). Based on this, noise from turbines is not expected to displace wildlife.

Due to the lower rpm of the Micon wind turbines used in Phase I, noise impacts are expected to be even less and thus to have an even lower possibility of displacing wildlife from the project area. During Phase II and beyond it is possible that PSCo might elect to use the Zond turbines which would have the slightly greater rpm and associated noise level.

Raptors. Although there have been only a few actual observations of raptors and other birds colliding with wind turbines, avian deaths can occur within wind energy project sites more often than in undeveloped reference areas. Causes of death on wind energy sites include collisions with turbines, electrocutions on power lines, collisions with electrical wires and guy wires and unknown causes (Orloff and Flannery, 1992). Since all project-related electrical power lines will be buried, the project will not contribute to risks of electrocution to raptors.

Activities in the project expansion area would be consistent with this discussion. However, some increased risk of electrocution could be associated with the substation and switching equipment. The Proposed Action calls for an examination of equipment posing a threat of electrocution and taking measures, where feasible, to shield such equipment from birds.

Studies have documented bird collisions with overhead transmission lines (Beaulaurier et al., 1984; Faanes, 1987) and with guyed communication towers (Avery and Clement, 1972; Seets and Bohlen, 1977) but raptor collisions with these structures appear to be rare. During a one-year monitoring program for bird fatalities at a site with two large wind turbines in Wyoming, all but two of 25 bird carcasses collected were found near a guyed 360-foot tall meteorological tower; none of the reported fatalities were raptors (Yeo et al., 1984). While it is possible that raptors and other birds may collide with the two, proposed 140-foot meteorological towers, accurate predictions of such occurrences are not possible. As proposed, placement of meteorological towers near operational turbines--which birds show a tendency to avoid--could help to reduce the risk of fatalities.

The proposed activities are consistent with this discussion. To date, no bird kills related to wind turbines have been observed and no carcasses that could be attributed to collisions with the wind turbines themselves have been recovered during the course of field surveys. However, in the fall of 1998, a great horned owl was found dead in the vicinity of a pole-mounted recloser switch located near the substation. This recloser switch is used as a point of interconnection between the phase of the project developed on the Ponnequin Acquisitions LLC and PSCo's substation.

Exposed wiring on this switch may have resulted in the owl's electrocution. Steps have since been taken to insulate or cover these exposed wires. Similar switchgear required for the subsequent phases of the project are contained in enclosures. This event was reported to the US Fish and Wildlife Service and to the Colorado Division of Wildlife.

Most raptor deaths attributable to collisions with wind turbines have been reported at large-scale (i.e., hundreds or thousands of turbines) wind projects in California. There, unlike the proposed project, hundreds of wind turbines with multiple designs cover many square miles. At those project areas turbines vary by height of support towers, tower structural components, turbine blade number and diameter, ground clearance of blades, and turbine orientation to the wind. For example, unlike the proposed towers, thousands of lattice towers at the Altamont Pass area incorporate horizontal supports which reports show are used as perches by raptors. Raptor mortality rates--defined as deaths (strikes) per turbine--were compiled from six wind energy site studies in California. Rates ranged from 0.007 to 0.058 deaths per turbine per year (Nelson and Curry, 1995). Although raptor overall mortality appears very low, actual deaths could be higher as it is unclear in some studies whether scavenging was not taken into account. The proposed monitoring plan would take this into account in reporting the results of project area surveys.

No collisions have been reported with one operational turbine and no carcasses attributed to a collision with a wind have been recovered during field surveys conducted in the project area. Recent studies have been undertaken to gauge scavenging in the project area and to estimate the potential success in recovering carcasses from bird-turbine collisions. Scavenging by carrion beetles could affect the recovery of the carcasses of small songbirds such as horned larks (Ryder, 1998).

Investigators of these large-scale wind sites have documented patterns related to mortality (Orloff and Flannery, 1992). These include:

1. Some species (American kestrel, red-tailed hawk, golden eagle) were killed more frequently than expected by their local abundance while others (turkey vulture, common raven) were killed less frequently than expected.

2. Immature raptors (golden eagle, red-tailed hawk) were killed at greater levels than their proportions in local populations.

3. Raptor mortality was strongly associated with turbines at the ends of rows and with turbines near canyons--more so than other measured habitat and topographic variables.

4. Raptor mortality decreased with higher turbine densities and increased where turbines were spaced farther apart.

5. Raptor mortality rates were higher where turbines were supported by open lattice

towers than other tower types (tubular towers, guyed-pipe support towers).

This last observation is undoubtedly related to raptor use of lattice towers for perching, especially at sites that have few or no alternative perch structures. Lattice towers with horizontal cross-members and/or platform catwalks used for servicing turbines have been used for perching by red-tailed hawks and golden eagles much more than towers that were supported by diagonal braces (Hunt, 1995). Since the towers used in the proposed project (see Figure 2-3) are designed with closely-spaced, sharply-angled diagonal braces, perching by raptors should be reduced. Tubular towers appear to make less attractive perch sites but still have been used by red-tailed hawks which perch on catwalks, platforms, and ladders (Hunt, 1995).

Phase I of the project now calls for the use of tubular towers that offer only minimal opportunities for perching. However, Phase II of the project and beyond could see the use of lattice towers (although this is unlikely). This, combined with the relatively low reported incidence of nesting birds in the vicinity of the project area (see Appendix C), should further reduce the likelihood of impacts to raptors.

Intuitively, the risk of collisions with turbines for raptors and other bird species should increase with increased avian utilization of a wind energy site, proximity of flight to turbines (Anderson et al., 1996), and flight behaviors that place birds in the path of turbine rotors. Pre-development studies at proposed wind energy project sites in Wyoming revealed that raptors utilized areas within 165 feet of the rim of plateaus significantly more than other areas. Moreover, within this spatial zone, raptors flew at heights that would coincide with the height of turbine rotors more often than in other parts of the study area (Johnson et al., 1997). In that study, eagles, buteo hawks and large falcons tended most often to fly at heights between 26 and 180 feet which would place them within the rotor sweep of proposed turbines (Johnson et al., 1997). In observations of golden eagles flying over the National Wind Technology Center in Colorado, nearly 50 percent of the relatively few eagles observed flew at or below 98 feet (the height of the site's tallest wind turbine) while nearly all of the golden eagles flew at or below 262 feet (Monahan, 1996). In comparison, the proposed turbines structures would be 244 to 251 feet tall (see Figure 2-3).

Field studies conducted in the project area since Spring 1997 suggest that few raptors, and even fewer golden eagles, make use of the project area and that raptor activity during the winter months virtually disappears (Ryder, 1998; Kerlinger and Curry, 1998).

The results of these studies show that there is some risk of raptor collisions with wind turbines but that risk, and the risk of a fatality, will vary from site and site and with the turbine design adopted. The use of slower rpm, more visible turbine rotors is expected to decrease the risk of collision and to help raptors to avoid the blades. To monitor the potential for collisions by raptors and other bird species, an impact monitoring program has been incorporated into the Proposed Action (see Appendix B). Incremental installation of turbines will allow monitoring to establish actual impacts on birds as the project progresses. The USFWS has agreed to work with PSCo in monitoring the impacts of the proposed project on these species. Monitoring also would be conducted in

cooperation with CDW to determine whether the project area is suitable for additional turbine capacity--assuming it is warranted by consumer participation in the Green Pricing Program.

The turbines now being installed for Phase I rotate at an even lower rpm (i.e., 15-22 rpm) than the turbines addressed in the original (1997) EA. This should further reduce the risk of a collision. A monitoring program has been implemented and field surveys are being conducted on a regular basis by a qualified wildlife biologist.

To help avoid impacts to raptors, the Proposed Action calls for low rpm turbines, removal of carrion, placement of towers in accordance with the results of the avian impact monitoring program, and the implementation of additional mitigation measures identified as necessary by the avian monitoring program. Monitoring results could suggest additional measures to discourage raptors' use of the project area and vicinity. Some of these include more frequent removal and disposal of livestock and big game carcasses from access roads and nearby lands to discourage scavenging, installation of structures to discourage nesting on existing transmission line towers (with the cooperation of the lines' owners), installation of measures on lattice towers to discourage perching, and the use of markings to enhance the visibility of rotor blades, and the reduction or elimination of livestock grazing on the project area. This last measure is proposed to accomplish two goals: eliminate livestock as a source of carrion and/or food (e.g., discharged placentas after calving and calves) and promote vegetative cover that may obscure prey, especially ground squirrels, from foraging raptors. However, increased vegetative cover may stimulate the rodent population to increase, thereby promoting raptor use of the area. These issues would be resolved through the proposed monitoring plan and consultation with members of the Technical Review Committee.

Construction of the first phase of the project was delayed until late 1998. This allowed the collection of more than one year of field data. Only one turbine was on site for the summer field season. No increase in the rodent population has been noted in this time.

Passerines and Other Migratory Birds. Horned larks and McCown's longspur are the two most commonly observed species in the project area, both of which are protected by the Migratory Bird Treaty Act. The average flight heights of these birds are below the proposed turbine blade height. Johnson et al. (1997) reported 85.7 percent of horned lark and 95.5 percent of McCown's longspur were observed flying from three to 23 feet from the ground. The proposed turbine rotors would clear the ground by approximately 89 feet. Flight heights of passerines, at least during breeding periods, are expected to be well below rotor-swept zones. But because passerines may fly higher during migration, turbine-caused mortality may be temporarily higher during spring and fall. However, the use of slow turning, highly visible turbine rotors is expected to decrease this risk and make it easier for birds to avoid turbine blades.

The Micon turbines now being installed for Phase I operate at an even lower rpm. Field observations conducted over the past year suggest that the flight paths of songbirds are consistently lower than the turbine blades (Ryder, 1998). Flight paths of migratory birds, such

as geese, were reported to be higher than the turbine blades.

Although wind turbines have been the focus of much of the avian mortality research, meteorological towers (or other types of guyed towers) may also be a source of fatalities to passerine birds (Yeo et al., 1984). Wind energy sites do report the recovery of passerine carcasses; however these mortalities have been considered insignificant when compared with local populations of these species (Nelson and Curry, 1995). Technically, however, causing *any* death of passerine birds--including horned larks and McCown's longspur--without a permit is a violation of the Migratory Bird Treaty Act *whatever the cause.* The monitoring plan incorporated into the Proposed Action, and incremental installation of turbines, would allow evaluation of impacts to passerines and other migratory birds as the project progresses. These results would be reviewed with the USFWS which is the agency granted the authority to enforce the Migratory Bird Treaty Act. Taking into account site selection, current levels of relatively low avian activity, and the design of the turbines proposed for this project, the Proposed Action is expected to have negligible, adverse impact on passerines and migratory birds.

The data gathered to date does not suggest the need to reconsider the site on the basis of impacts to migratory or other birds (Ryder, 1998; Kerlinger and Curry, 1998). Conditions in the original project area and the project expansion area are similar.

Mule Deer and Pronghorn. Big game species that occur within the project area may experience some disturbance due displacement from construction but this will be temporary, lasting 90 days or less for each stage. Minimal habitat loss will occur from the construction of wind turbines, access and service roads, and an interconnect substation. The project would not increase hunting pressure on local lands as access into the project area would continue to be restricted.

This discussion is applicable to the project expansion area as well.

Construction and operation-maintenance activities involving heavy equipment (e.g., a crane) may temporarily cause pronghorn to be displaced away from the project area. However, the typical visit to the project area by a maintenance person in a pick up truck would be similar to activity already occurring as part of ranching operations in the project area and vicinity. Evidence suggests that pronghorn would habituate to human activities and become less responsive to alarm stimuli (Reeve, 1984; Segerstrom, 1982; Alldredge and Deblinger, 1986). Yeo et al. (1984) found that pronghorn were not displaced from their home ranges in response to two large wind turbines near Medicine Bow, Wyoming. Mule deer appear to be even less sensitive to human-caused disturbances than pronghorn (Ward et al., 1980). While use of the project area by pronghorn and mule deer has not been systematically evaluated, it is believed to be irregular. Cattle grazing and winter feeding would continue in the project area at the private landowner's discretion. Depending upon the season, continuation of this activity could affect the number of pronghorn or mule deer likely to be found in the project area. Both mule deer and pronghorn tend to avoid areas, such as the project area, where intensive cattle grazing occurs (Yoakum and O'Gara, 1990; Loft et al., 1991). Fences along the west side of the project area would continue to

hinder pronghorn from moving into the project area. For these reasons the project is expected to have little if any impact on mule deer or pronghorn.

This discussion is applicable to the project expansion area. Existing conditions in the project expansion area are similar to those found in the original project area examined in the August 1997 EA. Pronghorn antelope have been observed in close proximity to the substation during construction activities. Herds of pronghorn have continued to use the project area and project expansion area. Actual use of a crane is for a very limited period. For example, once on site, a crane can erect seven turbines in the course of a week.

Other Species. Individual mammals, reptiles, and amphibians that may be present in the project area could be adversely affected by the Proposed Action (see discussion of general impacts above). It has been hypothesized that earth disturbed during construction activities would increase the potential for some burrowing species, especially ground squirrels, to increase within the project area, thereby increasing the prey base of predators such as raptors. Although burrowing rodents have been observed to recolonize recently disturbed ground on pipeline rights-of-way, it is difficult to predict how the ground squirrel population found within the project area would respond to the minor amount of disturbance associated with caisson foundations and buried feeder lines.

Field surveys conducted since Spring 1997 found a general lack of a prey base for predators and raptors in the project area and vicinity (Ryder, 1998). No increase in burrowing activity has been observed to be associated with the construction completed to date.

Five bat carcasses were collected from a wind energy site at Buffalo Ridge in Minnesota (Nelson and Curry, 1995). The small number of insectivorous bat species that might forage or travel through the project area would likely fly below the level of the proposed turbine blades. For example, highly maneuverable *Myotis* species tend to forage three to 20 feet above the ground or tree canopy (Fenton and Bell, 1979; Fitzgerald, 1994). (The project area is without trees.) Less maneuverable species such as the hoary, silver-haired and big brown bat tend to forage 20 to 33 feet above the ground (Fitzgerald, 1994). Since, the turbine rotors would clear the ground by approximately 89 feet, they are not expected to present a risk to bats that might be found in the project area.

This discussion is applicable to the Micon turbines and the project expansion area as well.

Plains spadefoot toads may use ephemeral pools for breeding, but typically travel 1,000 feet or less after breeding (Hammerson, 1986). In Colorado, they are active from May to September. It is possible that the toads could occur near the intermittent drainage on the southern edge of the project area or in drainages and wetlands in the vicinity of the access road. However, they would probably be in hibernation burrows when construction of the first phase is initiated. Over the course of project development, impacts to this species would be minimized as no disturbance would occur in the draw at the south edge of the project area. Similarly, no disturbance to

wetlands would occur. By avoiding the areas most likely utilized by breeding spadefoot toads, it is expected that this species would not be adversely affected by the project.

Conditions found in the project expansion area are similar and the conclusions reached in this discussion are applicable to that area as well.

4.14.2 No Action Alternative

Implementation of the No Action Alternative would have no impact, positive or negative, on populations of pronghorn or mule deer. For some other species, implementation of this alternative would avoid a slight increased risk of adverse impact that would be associated with vehicle collisions, disturbance to burrows, and collisions with turbine blades. However, implementation of this alternative would result in the loss of impact monitoring data which could be used at other wind energy projects to refine environmental risk assessments, site selection criteria, and impact avoidance measures. Other environmental benefits (e.g., air quality) discussed elsewhere in this chapter would be lost, too.

This discussion is applicable to the project expansion area as well.

4.15 Threatened, Endangered, and Species of Concern

Any activity that would adversely affect the population of a Federally-listed species would be considered a significant impact. Any project-related activity that would change the status of a candidate species under the Endangered Species Act would be considered a significant impact. Loss of any critical habitat for Federally-listed species would be considered a significant impact. Based on the analysis conducted for this EA, none of these impacts are expected to occur.

Due to the lack of habitat in the project expansion area, and the reported lack of observations of these species during field surveys conducted since Spring 1997, no adverse impacts are expected to occur.

4.15.1 Proposed Action

Section 7(a) of the Endangered Species Act obligates DOE to insure that actions which they authorize or permit are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat for such species. Because the Proposed Action has incorporated design, environmental protection, impact avoidance and other strategies intended to avoid impacts to these species, the Proposed Action is unlikely to result in adverse impacts to any Federally-listed threatened or endangered species. No critical habitat for such species would be affected. As discussed below, implementation of the Proposed Action is not likely to reduce the reproduction, number or distribution of a Federally-listed species such that it would appreciably reduce the likelihood of the survival and recovery of that species in the wild (50 CFR 420.02). Furthermore, in compliance with Section 7(d) of the

Endangered Species Act, monitoring of project phases would occur to ensure that no irreversible or irretrievable commitment of resources is made which would be likely to adversely affect Federally-listed species.

This discussion is consistent with activities proposed for the project expansion area.

Bald Eagle. Bald eagles are predominately found near large bodies of water such as lakes, rivers, or reservoirs where they feed on fish and/or waterfowl (Terres, 1980) but they will occasionally be seen in semideserts or grasslands, especially near prairie dog towns (Andrews and Righter, 1992). Because carrion can be an important winter food, sometimes eagles can be found on winter ranges for cattle and pronghorn, particularly during harsh winters when water sources have frozen (Davenport and Weaver, 1982). When suitable roost or perch sites are not available proximate to food sources, bald eagles can travel significant distances between the two. Based on all available information, bald eagles are expected to be very rare within or near the project area even during the winter or migrations. There are no known nests, roost or perch sites or concentration areas in the vicinity of the project area. No nests were found in a Spring 1997 survey of a 169 square-mile area centered on the project area or in an earlier survey conducted by the CDW (see Appendix D). Nonetheless, bald eagles may migrate through this part of Colorado. During winter months they can be seen along the South Platte River and some eagles congregate at ponds associated with the Rawhide Power Plant approximately 20 miles southeast of the project area. The cooling ponds associated with the power plant remain unfrozen during winter and attract waterfowl and consequently, bald eagles (Ryder, 1997). No ponds, lakes or water bodies likely to be used by eagles are found in the project area of vicinity.

No bald eagles have been observed near the project area during any of the field studies conducted since Spring 1997. None were observed, and no signs of nests or roosts were observed, during aerial surveys in 1997 and 1998 of a 169 square mile study area centered on the project site.

In the unlikely event that one were to pass through the project area, the same risks discussed for raptors would apply to bald eagles. Likewise, measures taken to minimize mortality of raptors and other birds would also minimize the risks to bald eagles. As proposed, carcasses found within the project area and access road would be promptly removed and disposed to discourage eagles from using the project area as a source of carrion. The use of slow turning, highly visible turbine rotors is expected to decrease the chance of collision and to allow birds to avoid turbines. Burial of electrical feeder lines and communication cables between turbines and the substation would deny birds another source of perches and avoid the risk of collision or electrocution associated with these structures.

In addition, as part of its Proposed Action, PSCo has agreed to monitor eagle activity and perching at the project area. The proposed monitoring would be conducted in cooperation with the USFWS and CDW and would be used to adjust operations to ensure that the risk of mortality remains negligible. Monitoring data also would be used to determine whether the project area can

accommodate additional turbine capacity with minimal risk to this species. If bald eagles are observed perching on existing power line towers or turbine towers in the project area and vicinity, steps would be taken (in cooperation with the USFWS) to install structures, barriers or other measures to discourage continued perching. Addition discussion of these measures may also be found in the discussion of avian impacts and impacts to raptors (Section 4.10) and in Chapter Two. With implementation of proposed environmental protection measures (see chapter two) and the proposed monitoring plan discussed in Appendix B, the Proposed Action would be unlikely to adversely affect this species or to jeopardize its continued existence.

The likelihood of perching or collisions would be further reduced by the use of the Micon tubular tower and its lower rpm blades for Phase I. The discussion above applies to the original project area and the expanded project area as well. For these reasons the expanded project would be unlikely to adversely affect this species or to jeopardize its continued existence.

Mountain Plover. The project area appears to provide suitable habitat for mountain plover which is a candidate species. However, none have been observed on the area (Appendix D). In response to concerns expressed by the USFWS, construction activities would be scheduled to avoid nesting mountain plover (mid-April through July) found in the project area. Mountain plover's typical flight and escape patterns typically do not reach the height of the proposed turbine blades which would be approximately 89 feet or more from the ground. Johnson et al. (1997) reported plover flying less than 23 feet in 87.5 percent of their observations. Under these conditions, implementation of the Proposed Action would be unlikely to adversely affect this species or its continued existence or status as a Federal candidate species.

Based on the lack of any observations of this species in the project area or the vicinity during avian surveys conducted since Spring 1997, implementation of the expanded project would be unlikely to adversely affect this species or its continued existence or status under the Endangered Species Act.

Swift Fox. Swift fox, a candidate species, could use grassland habitats in the vicinity of the project area. However, close cropping of grassland vegetation by cattle may reduce a potential habitat for this species and it probably uses the project area and vicinity only infrequently. While occasionally killed by vehicular traffic, this has been estimated as contributing only five percent of annual swift fox mortality (Rongstad et al., 1989). Although little documentation exists, road kills are probably associated with high-speed thoroughfares. Traffic volume on the access road and any slight increase in traffic on other roads would not affect its population. Swift fox populations are not expected to be negatively affected by the Proposed Action.

Due to the observed lack of a prey base, the similarity of conditions in the original project area and the project expansion area, and for the reasons stated above, implementation of the expanded project would be unlikely to adversely affect this species or its continued existence or status under the Endangered Species Act.

Colorado Butterfly Plant. The Colorado butterfly plant, a candidate species, is found growing in sub-irrigated, alluvial soils of drainage bottoms (Dorn, 1992; Fertig, 1994) which would not be affected by the project. Although this species occurs in the region, no populations have been reported anywhere in the vicinity of the project area. For these reasons, no negative impacts to this species are expected to occur.

Given the lack of suitable habitat in the project expansion area, and for the reasons stated above, implementation of the expanded project would be unlikely to adversely affect this species or its continued existence or status under the Endangered Species Act.

4.15.2 No Action Alternative

Implementation of the No Action Alternative would neither increase nor decrease the risk of jeopardizing the continued existence of any Federally-listed endangered or threatened species. Nor would it affect any critical habitat of such species. Implementation of this alternative is not expected to increase or reduce the reproduction, number, or distribution of a Federally-listed species such that it would appreciably affect the likelihood of the survival and recovery of that species in the wild. The status of candidate of species under the Endangered Species Act would not be affected, positively or negatively, if this alternative were implemented.

This discussion is applicable to the project expansion area as well.

CHAPTER FIVE
CUMULATIVE IMPACTS

5.1 Introduction

This section examines the cumulative impacts that could occur from existing and reasonably foreseeable human activities in the project area and vicinity, taken in combination with the proposed Ponnequin Wind Energy Project. Federal regulations define a cumulative impact as the impact on the environment which results from the incremental impact of the Proposed Action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or persons undertake such actions (40 CFR Part 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. No other projects are known to be proposed for the project area or adjacent lands. Existing lands have been altered by past and current transportation, transmission line, railroad, agricultural, bison and cattle grazing operations. This analysis assumes that impacts associated with these activities would continue. It also assumes that environmental protection measures discussed in chapter two as part of the Proposed Action and an impact monitoring program (Appendix B) would be implemented. No other projects are known to be proposed for the project area or adjacent lands.

This section also considers a change in turbine design (to tubular towers) and the potential for expansion of the project up to 48 wind turbine sites to meet recent and reasonably long-range foreseeable consumer demand for wind-generated electricity. An expanded project area would be needed to accommodate the additional turbines. The cumulative impacts of these changes in project design and geographic extent are considered in this section.

The installation of wind turbines within the project area would depend upon consumer demand and their willingness to pay a premium for wind-generated electricity. The Colorado Public Utilities Commission has approved up to 20 MW of capacity. The first two stages of the project call for the installation of up to 14 turbines or about 10 MW of capacity. However, the project area would accommodate up to 27 turbines which could generate up to 22 MW. For purposes of analyzing cumulative impacts, it was assumed that all 27 turbines would eventually be installed within the project area. The actual size of the project would depend upon consumer demand, the actual cost of constructing initial stages of the project, equipment performance and reliability, avian impacts (if any) found during the monitoring, and many other factors. As such, 27 turbines should be viewed as a reasonably foreseeable, maximum development scenario.

Consumer demand for wind-generated electricity has exceeded original projections and expectations. The reasonably foreseeable, maximum development scenario is now 48 turbines within the expanded project area. No other projects, which would affect this discussion of cumulative impacts, are known to be proposed for the project area or vicinity.

Incremental increases in cumulative impacts are noted below. Resources which would be avoided or otherwise not adversely affected by the Proposed Action or No Action Alternative--such as wetlands, floodplains, streams, surface water quality--have not been considered in this section.

Similarly, this conclusion applies to the expanded project as well.

5.2 Soils and Vegetation

Cumulative impacts of the project and existing grazing operations would increase slightly during the first stage of project development. However, cumulative impacts associated with the first stage of the project would be reduced by using all but 0.2 miles of existing ranch roads (requiring approximately 0.3 acres of surface disturbance) to access the project area. The substation would add another 0.9 acres of long-term surface disturbance to that already caused by existing roads and structures. Service roads within the project area would be two tracks. Other surface disturbance (e.g., trenches from cables) would be reclaimed. Future stages of project development would introduce only minimal changes in cumulative impacts to soil and vegetation as two-track service roads, ranch roads used for access, the substation and main feeder lines would already be in place. In addition, areas disturbed by earlier stages of the project would be undergoing reclamation and revegetation during the installation of additional turbine capacity at later stages of the project. Overall, even with the construction of a full 27 turbine facility, cumulative impacts to soils and vegetation would be nearly identical to those caused by existing roads, structures and agricultural operations.

To date project activities have been constructed consistent with this discussion. The project expansion would add an additional 2.75 acres of short-term disturbance due to the need for more extensive concrete foundations that support the tubular towers. Otherwise, the expanded project is consistent with the analysis presented in the August 1997 EA.

5.3 Air Quality

A fully developed wind facility would have a positive, cumulative impact on air quality when taken in combination with other environmental measures (e.g., energy conservation) being encouraged by the DOE and the State of Colorado to avoid the need for increased fossil-fuel burning at conventional generating stations. These savings in "avoided" emissions would be a positive, cumulative impact on regional air quality.

The expanded project would increase positive, cumulative impacts on regional air quality by increasing the amount of "avoided emissions."

5.4 Socioeconomic Conditions

Construction of a full 22 MW would increase benefits to Colorado-based businesses, contractors, workers and renewable energy ventures while allowing current economic uses of the project area

and vicinity to continue. Cumulative, county property tax revenues would increase. Additional state sales and use tax revenue would be collected. At the same time, the project would not contribute to adverse, cumulative impacts on community infrastructure or quality of life that can be associated with population and urban growth.

Positive, cumulative socioeconomic impacts would increase with expansion of the project. Because the existing land use could continue, no loss of government revenue or socioeconomic benefits from livestock grazing on private and state lands would occur.

5.5 Energy Resources

No energy production occurs within the project area of vicinity. Development of a 22 MW facility would have a positive, cumulative impact on the diversity of energy sources available to Colorado consumers and, in combination with other energy conservation programs, would have a positive, cumulative impact on reduced consumption of non-renewable energy sources.

An increase in cumulative, energy-related benefits would occur with the development of an expanded project potentially capable of generating up to approximately 35 MW.

5.6 Noise

Current activities in the project area produce little or no noise impacts. The proposed project would not contribute to a cumulative increase in impacts on noise-sensitive areas due to the relatively small size of the project, the use of a new design turbine, and the nearest residents' distance (at least 1.5 miles) from the project area.

The lower rpm turbines used in Phase I of the project are expected to generate even less noise than those originally proposed. Therefore, this conclusion is consistent with the expanded project.

5.7 Transportation

Construction traffic would be short-term and traffic associated with project maintenance--regardless of the number of turbines--would consist of no more than 1-2 pickup truck trips per day. As a result, no perceptible increase in long-term, cumulative impacts on transportation is expected to occur.

This conclusion is consistent with the expanded project. With remote monitoring of the site, traffic to the expanded project could average less than 1-2 trips per day over the life of the project Increased traffic from potential site visitors is considered to have minimal impacts.

5.8 Cultural Resources

A slight increase in the potential for impacts to subsurface sites would occur. Otherwise, the cultural resources inventory completed for the project area suggests that no increase in cumulative impacts is likely to occur. Additional cultural resources work on the access road would ensure the protection of sites, especially those which may be found in the vicinity of the old railroad grade.

No disturbance adversely affecting cultural resources has occurred and, with the protection measures incorporated into the proposed action, no adverse cumulative impacts are expected to occur. Completion of cultural resource surveys for the original and expanded project has added some additional site-specific data available on Colorado history and archeology.

5.9 Visual Resources

Wind turbines would draw attention to the site but would not produce adverse, cumulative impacts on designated scenic overlooks. Some decrease in the rural appearance of the project area and vicinity would be unavoidable due to the cumulative effects of the existing communication towers and transmission power lines in combination with the proposed wind turbines.

Cumulative impacts on visual resources will increase with the expansion of the number of turbines and the use of more visible tubular towers. However, the overall visual impact to the landscape from the project is expected to be minimal.

5.10 Land Use

While introducing a new, utility development to an agricultural area, development of up to 22 MW of capacity within the project area would be compatible with existing land uses. Agricultural use of the project area could continue. Compliance with Weld County permit requirements would ensure that the project does not contribute to cumulative, adverse impacts on land use.

No change in cumulative impacts to land use is expected to occur as a result of the expanded project given that existing land uses could continue.

5.11 Public Health and Safety

Existing communication towers taller than the proposed turbines are found in the vicinity of the project area. Because introduction of turbines up to a 22 MW facility would comply with applicable FAA regulations, no cumulative impact on risks to public health and safety is expected to occur.

This conclusion is consistent with the expanded project. Furthermore, the use of more visible

and locked tubular towers--rather than lattice towers--will further reduce these risks to the public.

5.12 Wildlife

Communication towers and guy lines already found in the vicinity of the project area constitute a potential threat to raptors and other species of birds. Construction of a full 22 MW facility could contribute to the cumulative risk of an avian fatality. However, an avian impact monitoring program would be started to assess ongoing, site-specific impacts associated with the initial and subsequent stages of the project. If increased impacts were noted, additional environmental protection measures discussed in chapter two or developed by the Technical Review Committee could be implemented to ensure that the project's contribution to cumulative impacts was minimized. Given the expected low probability of avian mortality due to site conditions, the proposed turbine design, the small-scale nature of the project, its phased development, and opportunities to implement additional mitigation measures, development of up to 22 MW of turbine capacity would be unlikely to add to cumulative impacts. Existing fences, roads, grazing, and agricultural practices already affect local wildlife populations. However, in comparison to these existing impacts, the project's contribution to cumulative impacts on wildlife populations is expected to be minimal due to the small amount of surface disturbance involved, the lack of new fencing, the use of existing roads, and the reclamation of disturbed areas.

The use of tubular, rather than lattice towers for Phase I will reduce the risk of avian fatalities. An increase in the number of turbines will slightly increase this risk but the use of lower rpm blades is expected to reduce this risk. No significant increase in the risk of cumulative impacts to avian species is expected to occur as a result of the expanded project. Data collected since Spring 1997 on avian use of the site found use of the site and the risk of collisions to be very low (Ryder, 1998; Kerlinger and Curry, 1998) especially in comparison to other wind sites commonly referenced in the scientific literature. The conclusions reached in the August 1997 EA are consistent with the expanded project.

5.13 Threatened, Endangered and Species of Concern

As proposed, the project's risk of impacts to Federally-listed species is already negligible. Environmental protection measures and the monitoring program discussed in chapter two would be adequate to ensure that the project does not result in cumulative, adverse impacts to candidate and Federally-listed these species.

These conclusions are supported by over a year of field surveys and are applicable to the expanded project as well.

CHAPTER SIX
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APPENDIX A
PUBLIC SCOPING

APPENDIX B
AVIAN IMPACTS MONITORING PLAN

PROPOSED AVIAN IMPACTS MONITORING PLAN

PONNEQUIN WIND PROJECT

The Proposed Avian Impacts Monitoring Plan is part of the Proposed Action. The plan is an explanation of how potential avian and wildlife impacts related to the development and operation of the proposed wind project would be monitored. Avian species--primarily raptors--would be the focus of the monitoring program which is intended to determine whether and/or how the project may actually be affecting these species. Observations conducted at other wind projects suggest that the level of risk to these species may be a function of 1) the frequency and duration of flight activity in proximity to wind turbines; and, 2) the type of behavior that occurs in close proximity to the turbines. For example, hunting within the project area and the use of lattice turbine towers for perching would be of concern. Monitoring activities include systematically observing and documenting these activities during the construction and operation of the facility. The data collected would be crucial in an ongoing assessment of the project and informing decisions about adjustments in facility design and operations that may (not) be needed as progressive phases of the project are implemented.

This monitoring plan was written as joint effort by PSCo, personnel from the National Renewable Energy Lab, and specialists on wildlife biology and avian impacts. Implementation of the plan would be the responsibility of PSCo. PSCo is working with Dr. Ron Ryder, Professor Emeritus, Colorado State University, Department of Fishery and Wildlife Biology to begin implementing the plan in 1997. Past work of the National Wind Coordinating Committee was instrumental in providing guidance on factors considered in the development of the plan. Keeping in mind the goals of the DOE Commercialization Ventures Program (see chapter one), this plan should be viewed as a cost-effective, first-year, "first-step" in project monitoring. Because bird-turbine collisions are statistically rare events, the plan is an attempt to cost-effectively capture as much data as possible during scheduled site visits. In response to actual field conditions, it is possible, however, that data collection goals and methodologies could be revised as the study proceeds. For example, sampling frequency could be intensified or reduced depending upon initial results. Observational techniques could be refined or adjusted to meet field conditions. The plan incorporates a technical review committee that would conduct reviews and make revisions as necessary. Data collection at reference or control areas, using techniques similar to those applied in the project area, would be contingent upon the availability of funding from the National Renewable Energy Lab. For these reasons, this plan should be considered a "work in progress."

I. Monitoring Plan Objectives

A. Document avian use and behaviors within the project area during construction and at least

through the first year of operation.

B. Document the use of existing power line poles and fence posts found within, and adjacent to, the project area and perching and/or nesting on lattice turbine towers

C. Document raptor nesting within the raptor nesting survey area.

D. Document possible changes in the prey base (e.g., as indicated by burrowing activities of ground squirrels) during project development.

E. Record and report avian fatalities proximate to wind turbines during construction and operation of the facility.

II. Data Acquisition

Monitoring of development is intended to provide several types of data that can be used to analyze factors related to the following:

A. Avian use and abundance

B. Prey base response to site development

C. Avian fatalities

D. Avian use of perching structures

E. Raptor nesting activity within the nesting survey area

III. Data Collection Methods

Data collection methods will be applied to the project area and the raptor survey areas as described below. These methods would also be applied to a reference or control area assuming the availability of funding.

A. Avian Use

Three transect lines will be established. The first transect will be along the line of the tower structures. Point count observations will be made at each end of this transect line. The two remaining transects will be parallel to each other and perpendicular to the row of turbines and will intersect the turbine string. This configuration will allow the observer to look down the axis

of a turbine row and document the flights across the row. Walking the parallel transects which are perpendicular to the axis of the turbine row will permit observations of local passerine activity at various points of distance from the turbine row.

A 90 minute sampling cycle would begin with a 10 minute point count at one end of the turbine string axis transect. Each of the perpendicular transects would be walked with passerine observations made and recorded on a continuous basis. In addition, continuous observations of raptor behavior will be made and recorded on a separate data form. The cycle will end with an additional 10 minute point count at the other end of the turbine axis transect. From April through October, two cycles will be run in the morning and in the afternoon, one day each week. The cycles will be repeated one day every other week from November through March.

The observer(s) will record pertinent information (temp, wind, cloud cover, etc.) on standard data forms as well as estimated flight heights relative to wind turbine structures along the turbine axis. Random observations made outside of a specific sampling protocol will be recorded separately. For example, after the point count has been completed raptor observations can be made but the data will not be recorded on the same data sheet. This will enable some real time data collection on specific behaviors which could provide more descriptive information on which to base future management decisions.

B. Raptor Perching

Prior to construction all perching activity on the project area and on existing power line towers within the range of the point count observation stations will be recorded during the field observations referenced above. During and after construction raptor perching behavior will continue to be recorded. In addition, searches will be made for any additional evidence of perching on towers and other locations on the site.

C. Raptor Nesting

Two aerial surveys will be conducted from early May, to mid-June within the Raptor Nesting Survey Area (previously established by the Spring 1997 survey) to determine nest site occupancy and estimate the production of young. A decline in nesting activity coupled with fatalities recorded within the project area could trigger investigations into the population impact issue.

One on-the-ground survey of nesting raptors within the 169 square-mile Raptor Nesting Survey Area will be conducted in the spring by mid-June. Due to the presence of private land with restricted access, this survey must be confined to portions of the Terry Bison Ranch and the City of Fort Collins Meadow Springs Ranch located west of Interstate 25 which are within the Raptor Nesting Survey Area.

D. Prey Base Inventory

Prior to construction, test plots will be established. Plots will be monitored on a systematic basis through the phases of project development and operations. Various methods, as described in the biological literature, could be used to inventory prey base within these plots.

E. Avian Fatalities

A rectangular area extending 200 ft from all sides of the turbine string(s) will be methodically searched at a rate of frequency still to be determined. The interval between searches will be determined by the scavenger rate for the site for the particular season of the year. Due to the size of the project are, all the turbines will be included in the survey. Unless the vegetation is no longer grazed, it will not be necessary to test the observational abilities of the searcher(s). It is anticipated that a carcass survey could be conducted each day that other observational data is collected. The function of these surveys is to determine if there are any turbine related injuries and/or fatalities.

IV. Data Analysis

As appropriate, statistical analysis will be conducted on the collected data. Actual data analysis techniques and reporting methods will be developed in consultation with various experts in the field of avian impacts.

V. Reference-Control Sites

Subject to funding from the National Renewal Energy Laboratory and the permission of adjacent landowners, one or more reference sites will be established. The same study design will be implemented at the reference site(s) which will enable comparisons of raptor use, etc. to be made between the project area and undeveloped site(s).

V. Reporting and Reviewing the Results of the Monitoring Program

A. Reporting

Quarterly reports of the results of the monitoring program will be prepared. An annual summary of the monitoring program will also be prepared and will be made available for public review.

All fatalities will be documented and reported to the U.S. Fish and Wildlife Service using the Wildlife Response and Reporting System already in use at several wind projects. A second raptor fatality will trigger a more intensive field investigation in an attempt to determine the

circumstances under which the collision(s) occurred and whether some form of mitigation can be suggested. This more intensive field investigation will be developed and implemented in consultation with the Technical Review Committee.

B. Technical Review Committee

A Technical Review Committee will be established. Representatives of the U.S. Fish and Wildlife Service, the Colorado Division of Wildlife, Public Service of Colorado, DOE and a public interest/environmental group will be invited to participate on this Committee. Quarterly summaries of monitoring results will be forwarded to each of the representatives. An annual review of the project and the findings of the monitoring program will be completed and available for the Committee's and public review. Additional consultations will be scheduled as needed or on the request of any representative. Significant changes in study methodology, reporting of data collection methods will be discussed with Committee members prior to implementation.

APPENDIX C

WILDLIFE SPECIES LIST

Appendix C.
Wildlife Species Potentially Occurring or Known to Occur in the Project Area and Vicinity

Common Name	Scientific Name	Seasonal Presence
Mammals		
Dwarf Shrew	*Sorex nanus*	Year Round
Merriam's Shrew	*Sorex merriami*	Year Round
Small-footed Myotis	*Myotis ciliolabrum*	Year Round
Little Brown Myotis	*Myotis lucifugus*	Year Round
Fringed Myotis	*Myotis thysanodes*	Year Round
Silver-haired Bat	*Lasionycteris noctivagans*	Spring-Fall Migration
Big Brown Bat	*Eptesicus fuscus*	Year Round
Hoary Bat	*Lasiurus cinereus*	Spring-Fall Migration
Desert Cottontail	*Sylvilagus audubonii*	Year Round
Black-tailed Jackrabbit	*Lepus californicus*	Year Round
White-tailed Jackrabbit	*Lepus townsendii*	Year Round
Wyoming Ground Squirrel	*Spermophilus elegans*	Year Round
Spotted Ground Squirrel	*Spermopphilus spilosoma*	Year Round
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	Year Round
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Year Round
Northern Pocket Gopher	*Thomomys talpoides*	Year Round
Olive-backed Pocket Mouse	*Perognathus fasciatus*	Year Round
Plains Pocket Mouse	*Perognathus flavescens*	Year Round
Silky Pocket Mouse	*Perognathus flavus*	Year Round
Hispid Pocket Mouse	*Perognathus hispidus*	Year Round
Ord's Kangaroo Rat	*Dipodomys ordii*	Year Round
Plains Harvest Mouse	*Reithrodontomys montanus*	Year Round
Western Harvest Mouse	*Reithrodontomys megalotis*	Year Round
Deer Mouse	*Peromyscus maniculatus*	Year Round
Northern Grasshopper Mouse	*Onychomys leucogaster*	Year Round
Bushy-tailed Woodrat	*Neotoma cinerea*	Year Round
Prairie Vole	*Microtus ochrogaster*	Year Round
Coyote	*Canis latrans*	Year Round
Swift Fox	*Vulpers velox*	Year Round
Long-tailed Weasel	*Mustela frenata*	Year Round
Badger	*Taxidea taxus*	Year Round
Striped Skunk	*Mephitis mephitis*	Year Round

Appendix C.
Wildlife Species Potentially Occurring or Known to Occur in the Project Area and Vicinity

Common Name	Scientific Name	Seasonal Presence
Mule Deer	*Odocoileus hemionus*	Year Round
Pronghorn	*Antilocapra americana*	Year Round
Birds		
Turkey Vulture	*Cathartes aura*	Spring-Fall Migration
Bald Eagle	*Haliaeetus leucocephalus*	Winter, Migration
Northern Harrier	*Circus cyaneus*	Year Round
Sharp-shinned Hawk	*Accipiter striatus*	Spring-Fall Migration
Cooper's Hawk	*Accipiter cooperii*	Spring-Fall Migration
Northern Goshawk	*Accipiter gentilis*	Spring-Fall Migration
Swainson's Hawk	*Buteo swainsoni*	Summer, Migration
Red-tailed Hawk	*Buteo jamaicensis*	Year Round
Ferruginous Hawk	*Buteo regalis*	Year Round
Rough-legged Hawk	*Buteo lagopus*	Winter, Migration
Golden Eagle	*Aquila chrysaetos*	Year Round
American Kestrel	*Falco sparverius*	Year Round
Merlin	*Falco columbarius*	Winter, Migration
Prairie Falcon	*Falco mexicanus*	Year Round
Peregrine Falcon	*Falco peregrinus*	Spring-Fall Migration
Killdeer	*Charadrius vociferus*	Year Round
Mountain Plover	*Charadrius montanus*	Summer, Migration
Long-billed Curlew	*Numenius americanus*	Spring-Fall Migration
Mourning Dove	*Zenaida macroura*	Summer, Migration
Barn Owl	*Tyto alba*	Summer, Migration
Great Horned Owl	*Bubo virginianus*	Year Round
Snowy Owl	*Nyctea scandiaca*	Winter, Migration
Burrowing Owl	*Athene cunicularia*	Summer, Migration
Short-eared Owl	*Asio flammeus*	Winter, Migration
Common Nighthawk	*Chordeiles minor*	Summer, Migration
Say's Phoebe	*Sayornis saya*	Summer, Migration
Western Kingbird	*Tyrannus vertiualis*	Summer, Migration
Scissor-tailed Flycatcher	*Tyrannus forficatus*	Summer, Migration
Horned Lark	*Eremophila alpestris*	Year Round
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Summer, Migration
Bank Swallow	*Riparia riparia*	Summer, Migration

Appendix C.
Wildlife Species Potentially Occurring or Known to Occur in the Project Area and Vicinity

Common Name	Scientific Name	Seasonal Presence
Cliff Swallow	*Hirundo pyrrhonota*	Summer, Migration
Barn Swallow	*Hirundo rustica*	Summer, Migration
Black-billed Magpie	*Pica pica*	Year Round
American Crow	*Corvus brachyrhynchos*	Year Round
Common Raven	*Corvus corax*	Year Round
Rock Wren	*Salpinctes obsoletus*	Spring-Fall Migration
Mountain Bluebird	*Sialia currucoides*	Spring-Fall Migration
Northern Mockingbird	*Mimus polyglottos*	Summer, Migration
Sage Thrasher	*Oreoscoptes montanus*	Winter, Migration
Northern Shrike	*Lanius excubitor*	Winter, Migration
Loggerhead Shrike	*Lanius ludovicianus*	Summer, Migration
Dickcissel	*Spiza americana*	Summer, Migration
Cassin's Sparrow	*Aimophila cassinii*	Summer, Migration
Chipping Sparrow	*Spizella passerina*	Spring-Fall Migration
Brewer's Sparrow	*Spizella breweri*	Summer, Migration
Vesper Sparrow	*Pooecetes gramineus*	Spring-Fall Migration
Lark Sparrow	*Chondestes grammacus*	Summer, Migration
Lark Bunting	*Calamospiza melanocorys*	Summer, Migration
Savannah Sparrow	*Passerculus sandwichensis*	Spring-Fall Migration
Grasshopper Sparrow	*Ammodramus savannarum*	Summer, Migration
McCown's Longspur	*Calcarius mccownii*	Summer, Migration
Lapland Longspur	*Calcarius lapponicus*	Winter, Migration
Chestnut-collared Longspur	*Calcarius ornatus*	Summer, Migration
Snow Bunting	*Plectrophenax nivalis*	Winter, Migration
Western Meadowlark	*Sturnella neglecta*	Year Round
Brewer's Blackbird	*Euphagus cyanocephalus*	Summer, Migration
Brown-headed Cowbird	*Molothrus ater*	Summer, Migration
House Finch	*Carpodacus mexicanus*	Year Round
Common Redpoll	*Carduelis flammea*	Winter, Migration
Pine Siskin	*Carduelis pinus*	Winter, Migration
Reptiles		
Lesser Earless Lizard	*Holbrookia maculata*	Year Round
Short-horned Lizard	*Phrynosoma douglassii*	Year Round
Eastern Fence Lizard	*Sceloporus graciousus*	Year Round

Appendix C.
Wildlife Species Potentially Occurring or Known to Occur in the Project Area and Vicinity

Common Name	Scientific Name	Seasonal Presence
Many-lined Skink	*Eumeces multivirgatus*	Year Round
Six-lined Racerunner	*Cnemidophorus sexlineatus*	Year Round
Racer	*Coluber constrictor*	Year Round
Western Hognose Snake	*Heterodon nasicus*	Year Round
Milk Snake	*Lampropeltis triangulum*	Year Round
Bullsnake	*Pituophis melanoleucus*	Year Round
Plains Blackhead Snake	*Tantilla nigriceps*	Year Round
Western Rattlesnake	*Crotalus viridis*	Year Round
Amphibians		
Tiger Salamander	*Ambystoma tigrinum*	Year Round
Plains Spadefoot	*Scaphiopus bombifrons*	Year Round

Raptor nests observed within an approximate 169-square mile area surrounding the Ponnequin Wind Energy Project during ground and aerial surveys conducted in 1997 and aerial surveys conducted in 1998

(Specific location data has been deleted to protect nesting birds)

Raptor Species	Nest Status	Survey Date	Nest Substrate	Distance (km) & Direction to MET Tower
Golden eagle	active active(1)	4/26/97 6/27/98	low rock ledge	11.9 NW
Red-tail hawk	active not visible	4/26/97 6/27/98	riparian tree	9.9 NW
Red-tail hawk	occupied not visible	4/26/97 6/27/98	riparian tree	9.4 SW
Red-tail hawk	occupied not visible	4/26/97 6/27/98	riparian tree	9.0 SW
Golden eagle	occupied nest fallen	4/26, 5/04/97 6/27/98	rock ledge	6.8 SW
Ferruginous hawk	active active(2)	4/26/97 6/27/97	rock pinnacle	8.9 SW
Ferruginous hawk	inactive inactive	4/26/97 6/27/98	rock outcrop	9.4 SW
Swainson's hawk	inactive not visible	5/04/97 6/27/98	riparian tree	10.5 SW
Great horned owl	occupied not visible	5/04/97 6/27/98	riparian tree	11.1 SW
Golden eagle	inactive not visible	5/04/97 6/27/98	riparian tree	10.8 SW
Swainson's hawk	active not visible	4/26, 5/04/97 6/27/98	riparian tree	10.9 S
Prairie falcon	occupied inactive	4/26, 5/04/97 6/27/98	cliff cavity	6.7 SW
Unknown buteo	inactive inactive	4/26, 5/04/97 6/27/98	rock cliff	6.6 SW

Unknown buteo	inactive inactive	5/04/97 6/27/98	rock cliff	6.2 SW
Unknown buteo	inactive inactive	4/26/97 6/27/98	rock cliff	4.9 S
Swainson's hawk	inactive inactive	5/04/97 6/27/98	isolated tree	1.1 SE
Swainson's hawk	inactive not visible	5/04/97 6/27/98	riparian tree	3.8 SE
Red-tail hawk	active not visible	4/26/97 6/27/98	isolated tree	4.7 SE
Golden eagle	active inactive	4/26/97 6/27/98	rock cliff	7.7 SE
Unknown buteo	inactive inactive	4/26/97 6/27/98	rock cliff	7.8 SE
Ferruginous hawk	occupied active(1)	4/26/97 6/27/98	rock cliff	9.1 SE
Ferruginous hawk	inactive inactive	4/26/97 6/27/98	rock outcrop	6.5 S
Ferruginous hawk	inactive inactive	4/26/97 6/27/98	rock outcrop	10.0 SE
Unknown buteo	inactive inactive	4/26/97 6/27/98	rock cliff	10.3 SE
Ferruginous hawk	active inactive	4/26/97 6/27/98	rock cliff	10.6 SE
Golden eagle	active inactive	4/26/97 6/27/98	isolated tree	7.9 SE
Ferruginous hawk	active active(2)	4/26/97 6/27/98	rock cliff	11.6 SE
Golden eagle	active active(1)	4/26/97 6/27/98	rock cliff	13.6 SE

APPENDIX D
WILDLIFE AGENCIES -- CORRESPONDENCE

NOT AVAILABLE ELECTRONICALLY